

Fig.1

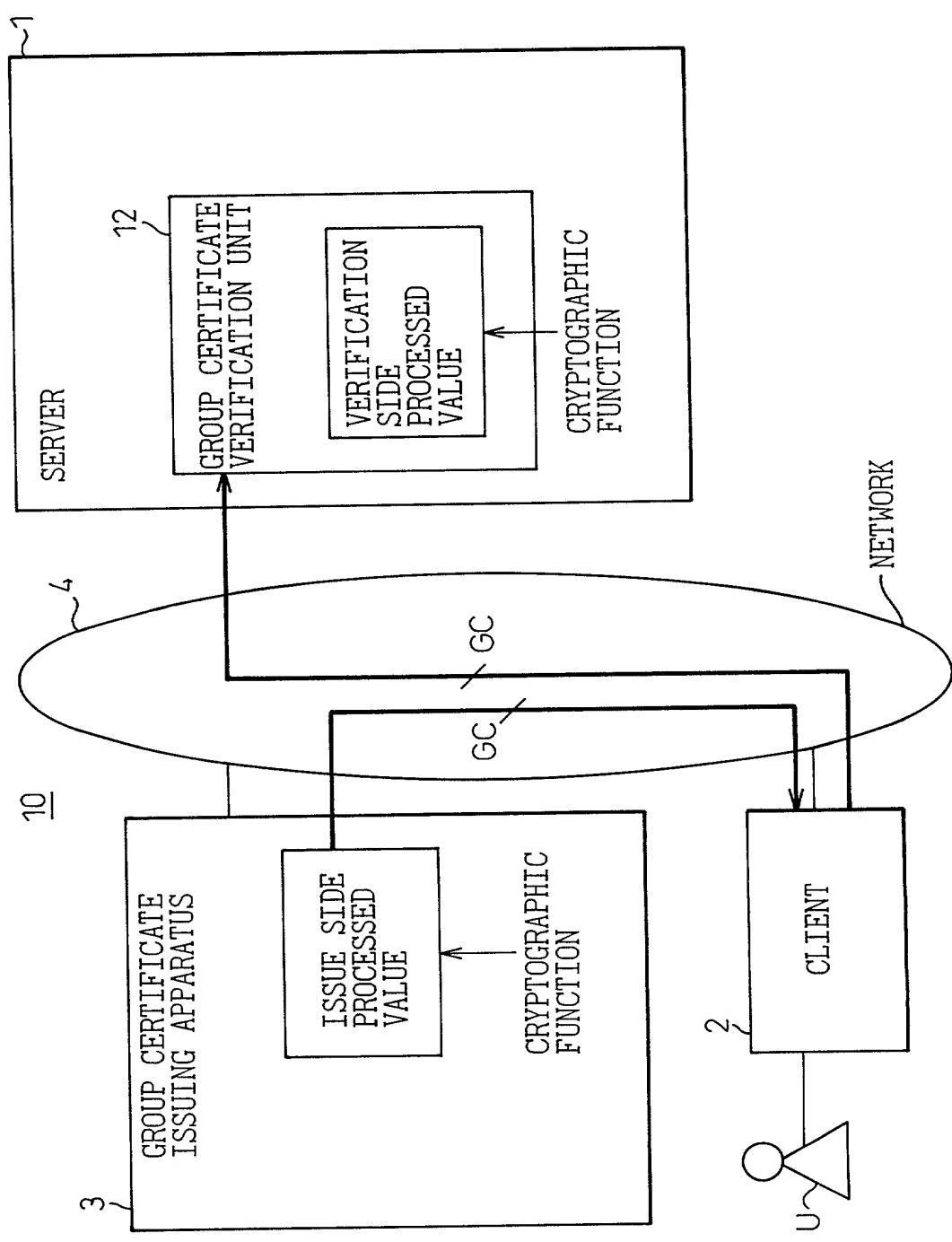


Fig. 2

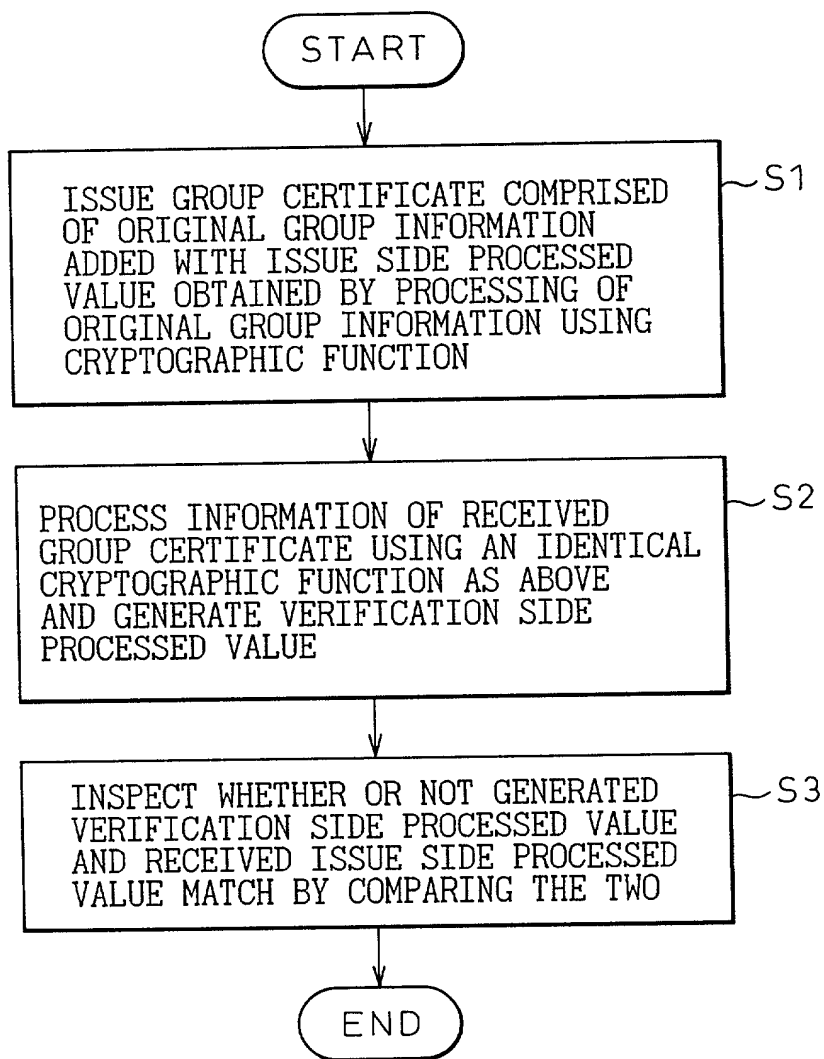


Fig. 3

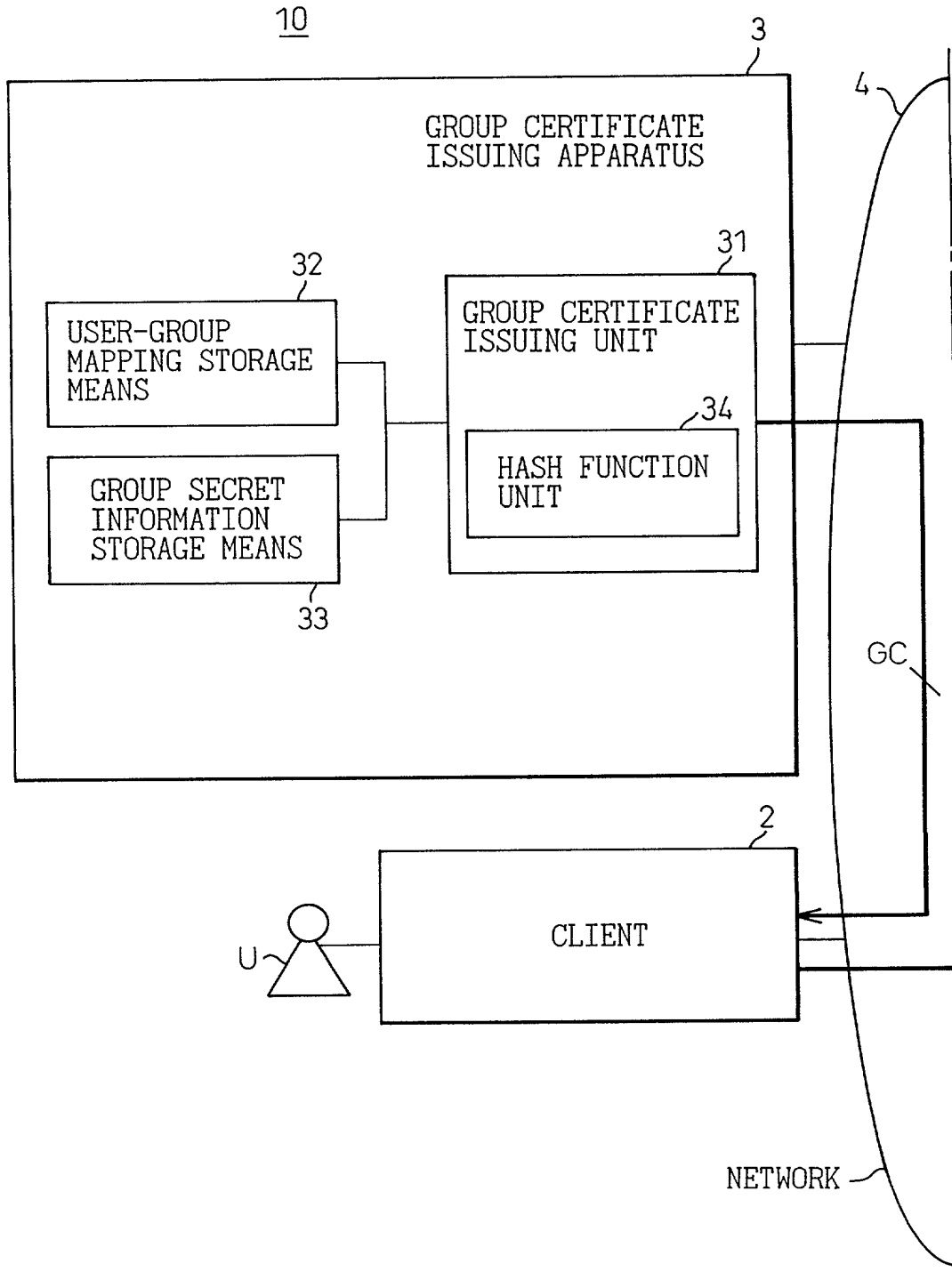


Fig. 4

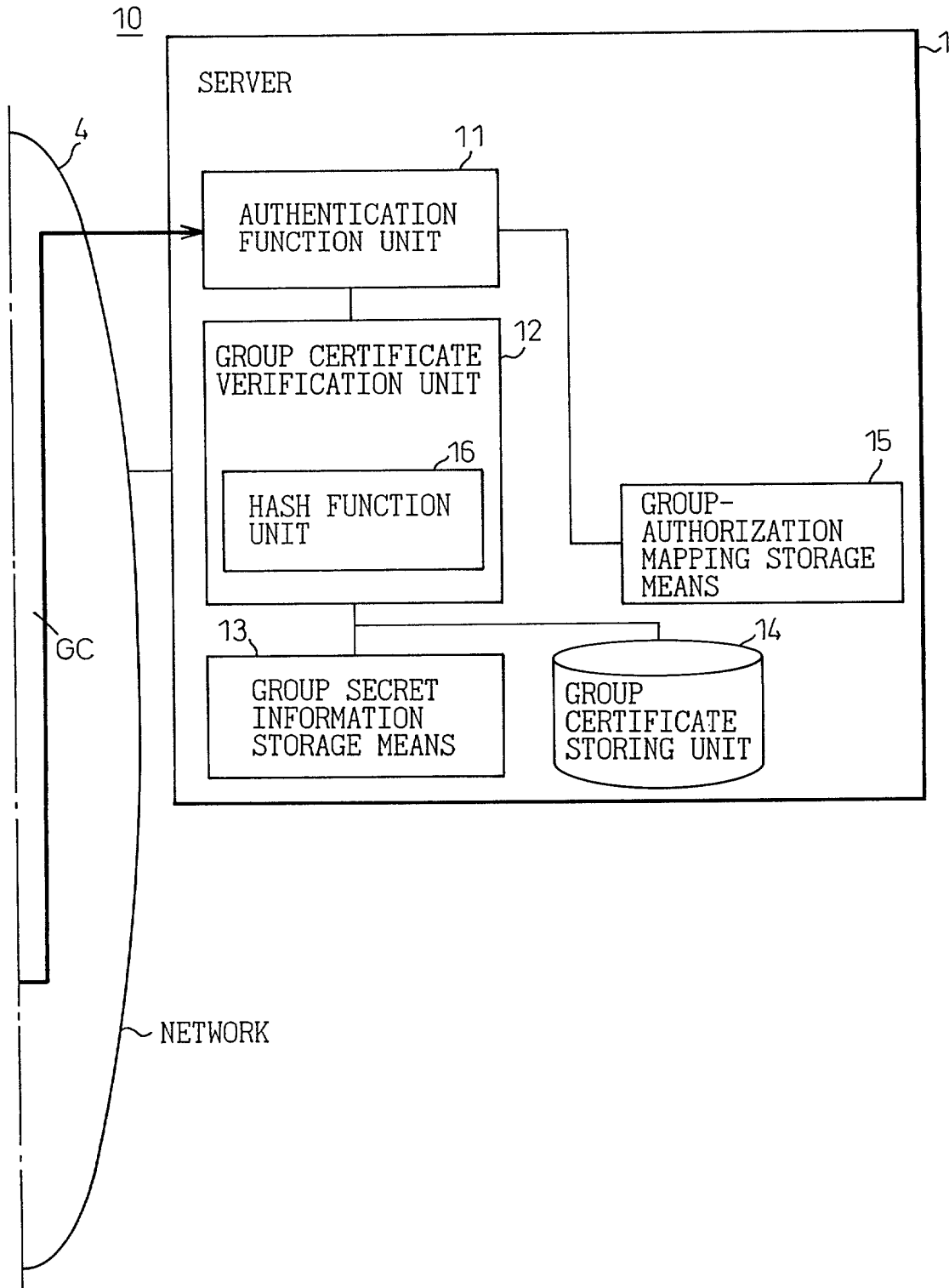


Fig.5

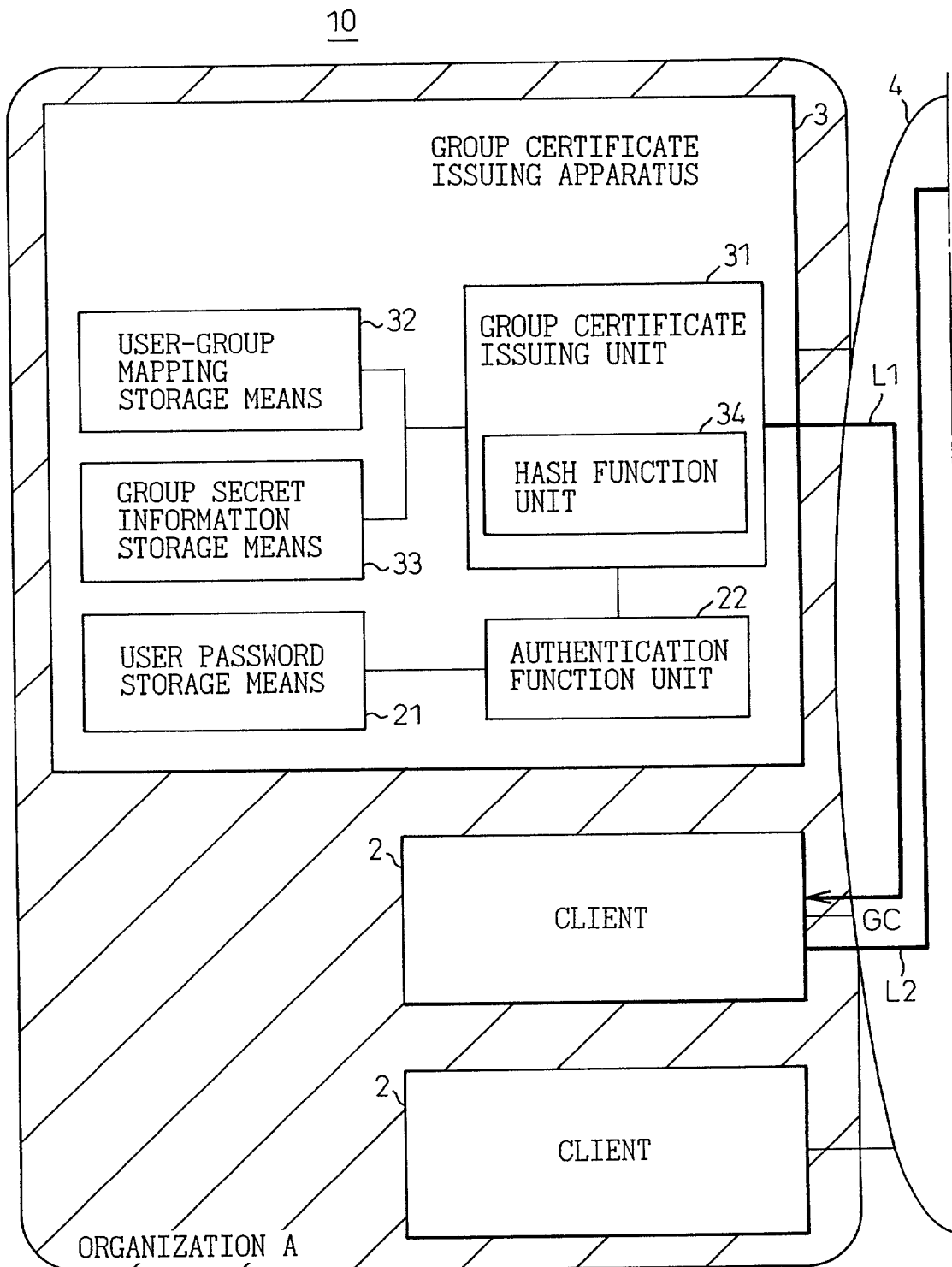


Fig. 6

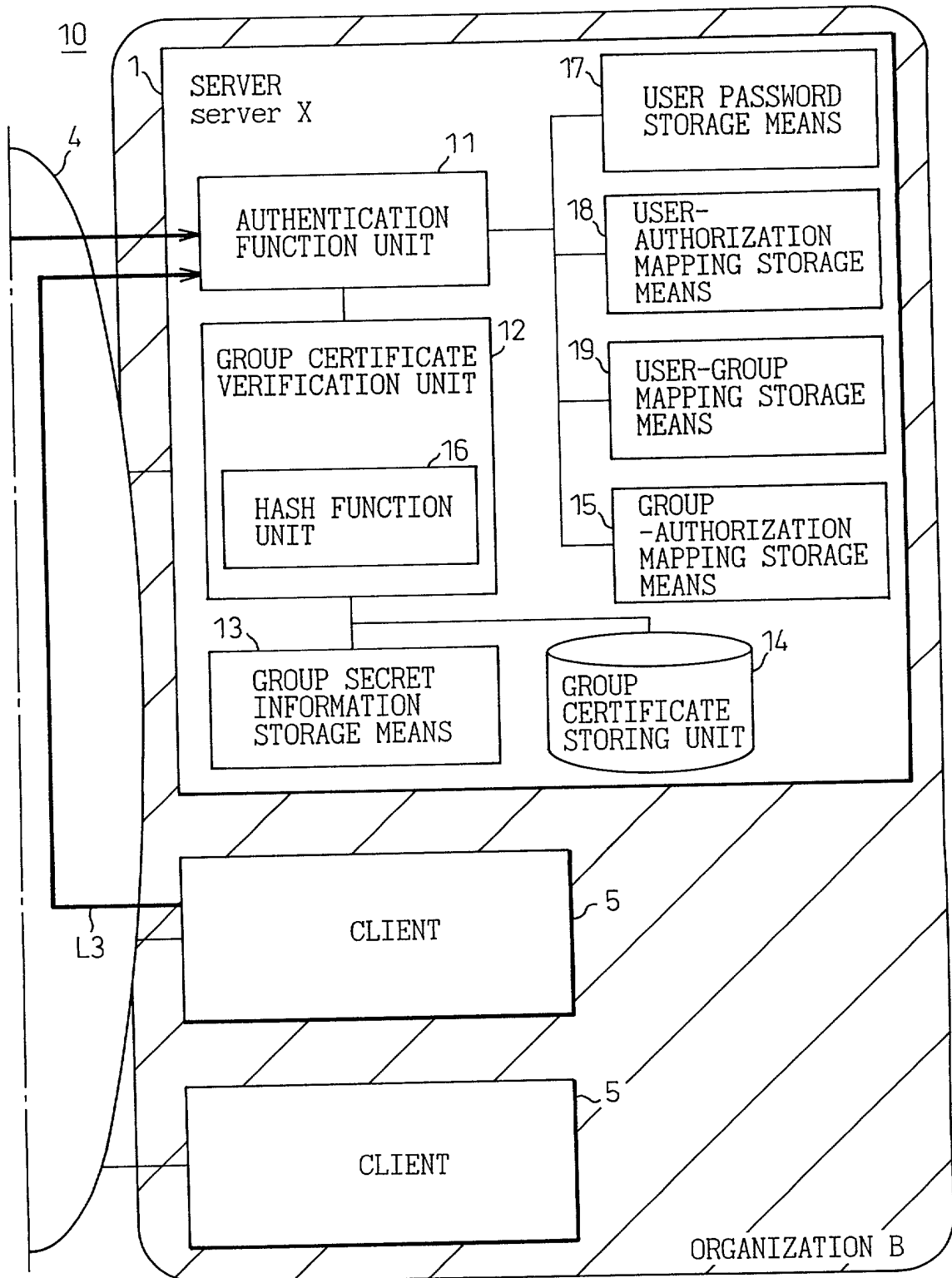


Fig. 7

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USER	GROUP
server X,user A	server X.group 3
server X,user B	server X.group 1
server Y,user A	server Y.group 4
server Y,user C	server Y.group 4
⋮	⋮

Fig. 8

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USER	GROUP
server X,user A	server X.group 3
server X,user B	server X.group 1
server Y,user A	server Y.group 4
server Y,user C	server Y.group 4
⋮	⋮

Fig.9

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GROUP	SECRET INFORMATION
server X.group 1	secret 1
server X.group 2	secret 2
server X.group 3	secret 3
server Y.group 4	secret 4
⋮	⋮

Fig.10

13

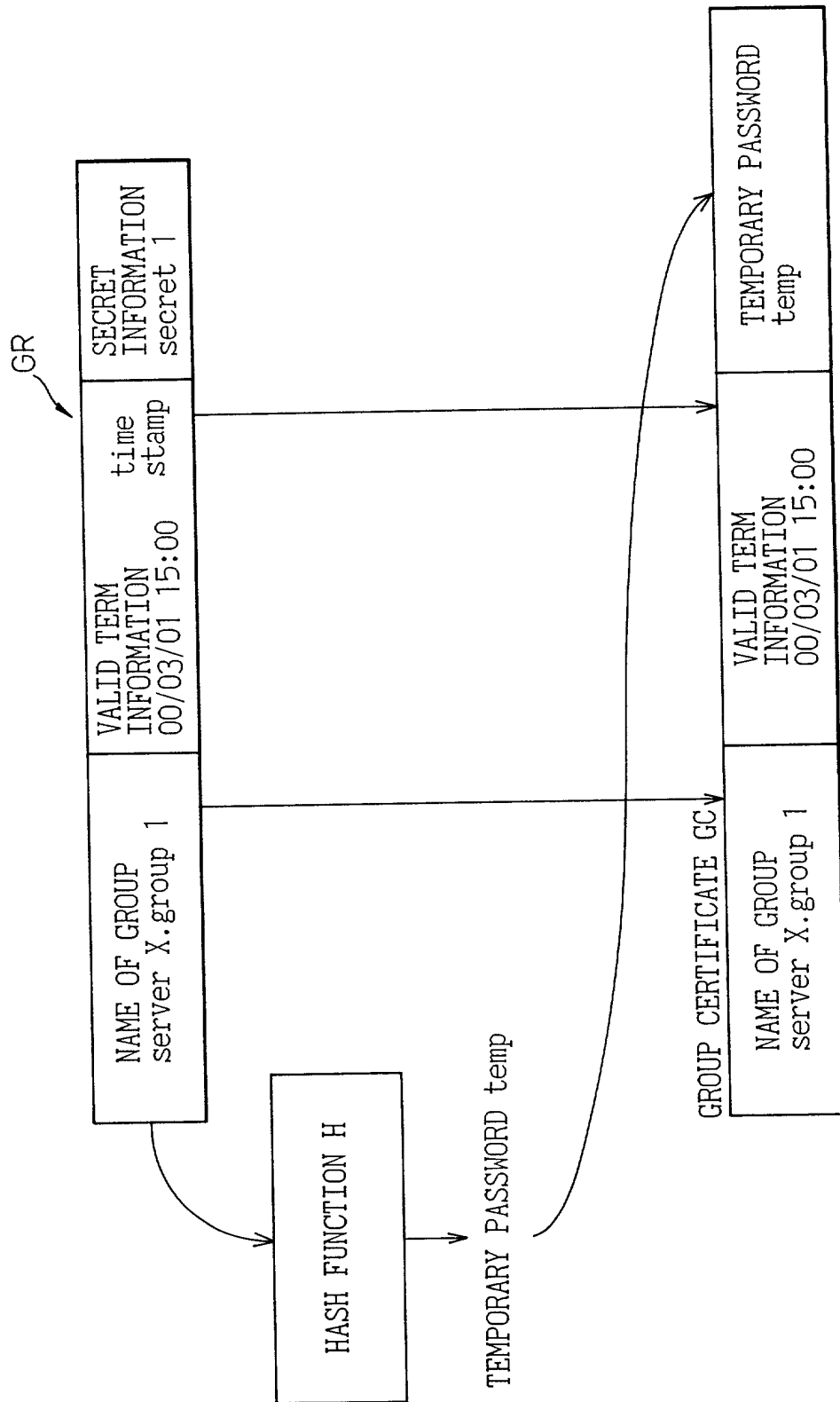
GROUP	SECRET INFORMATION
group 1	secret 1
group 2	secret 2
group 3	secret 3
⋮	⋮

Fig.11

15

NAME OF GROUP	AUTHORIZATION	
	OBJECT	CONTENT
group 1	file A	r-
group 1	file B	—
group 2	file A	rw
group 2	file B	r-
group 3	file A	rw
group 3	file B	rw
⋮	⋮	⋮

Fig.12



# Fig.13

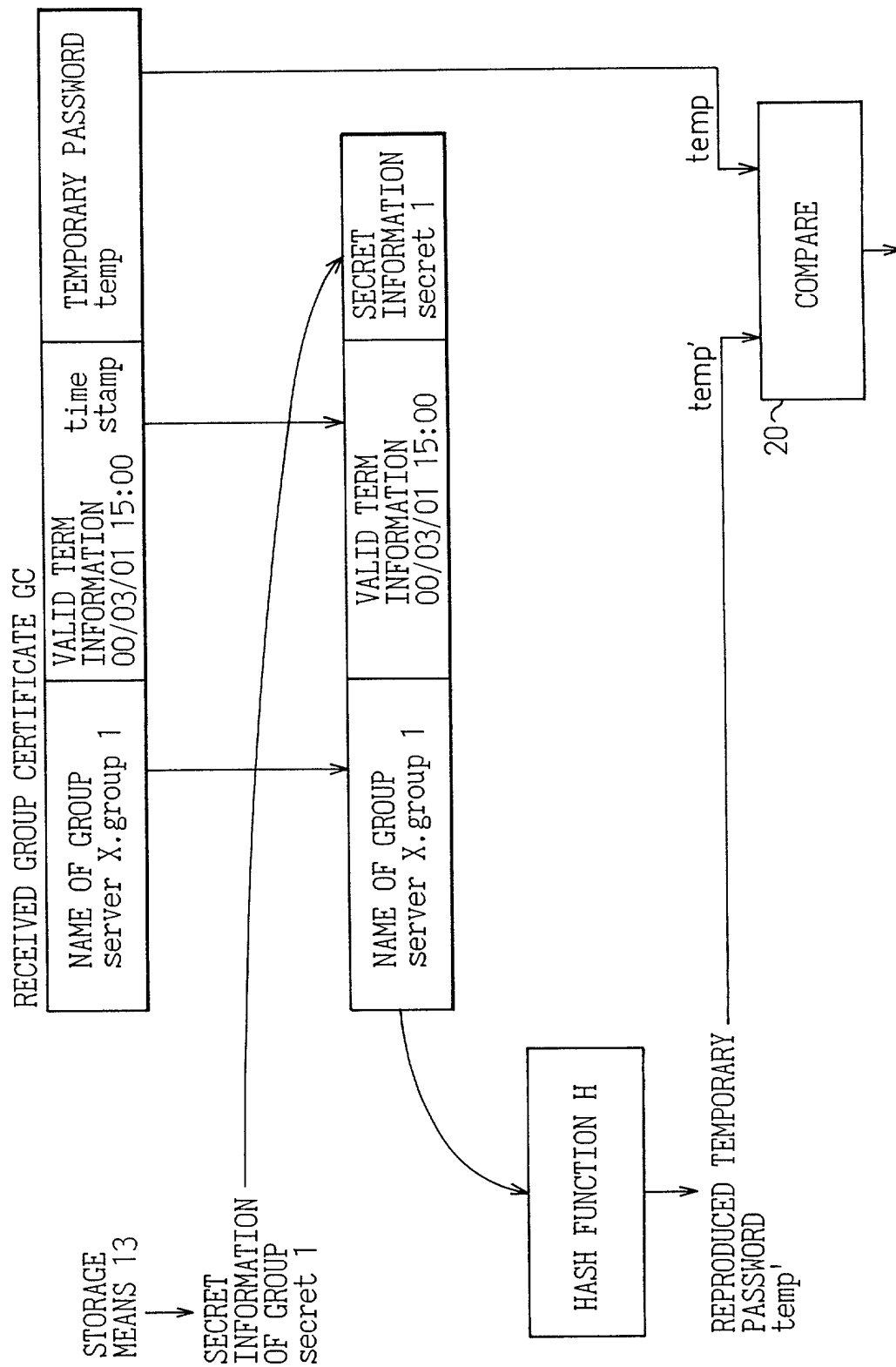


Fig.14

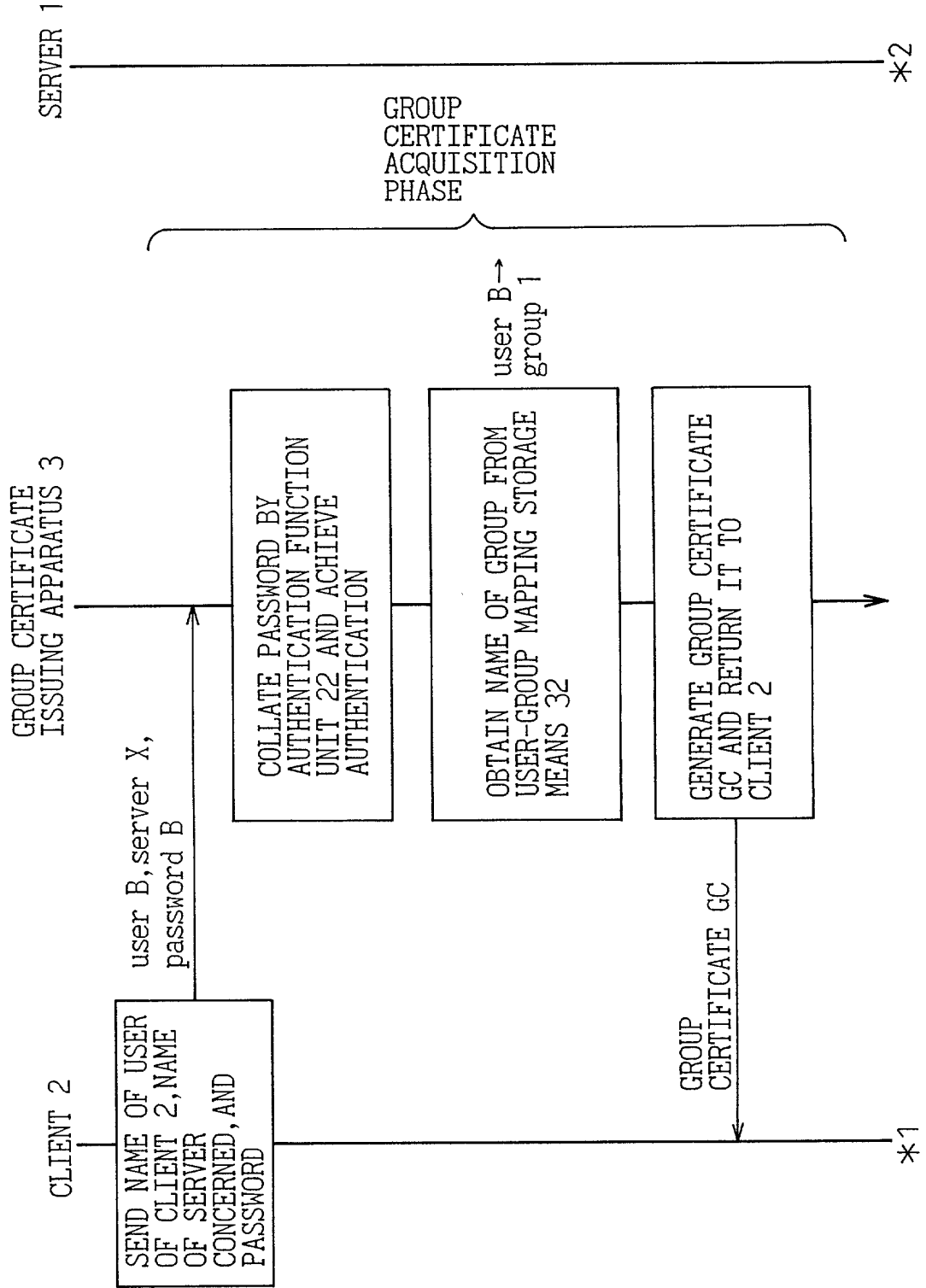


Fig.15

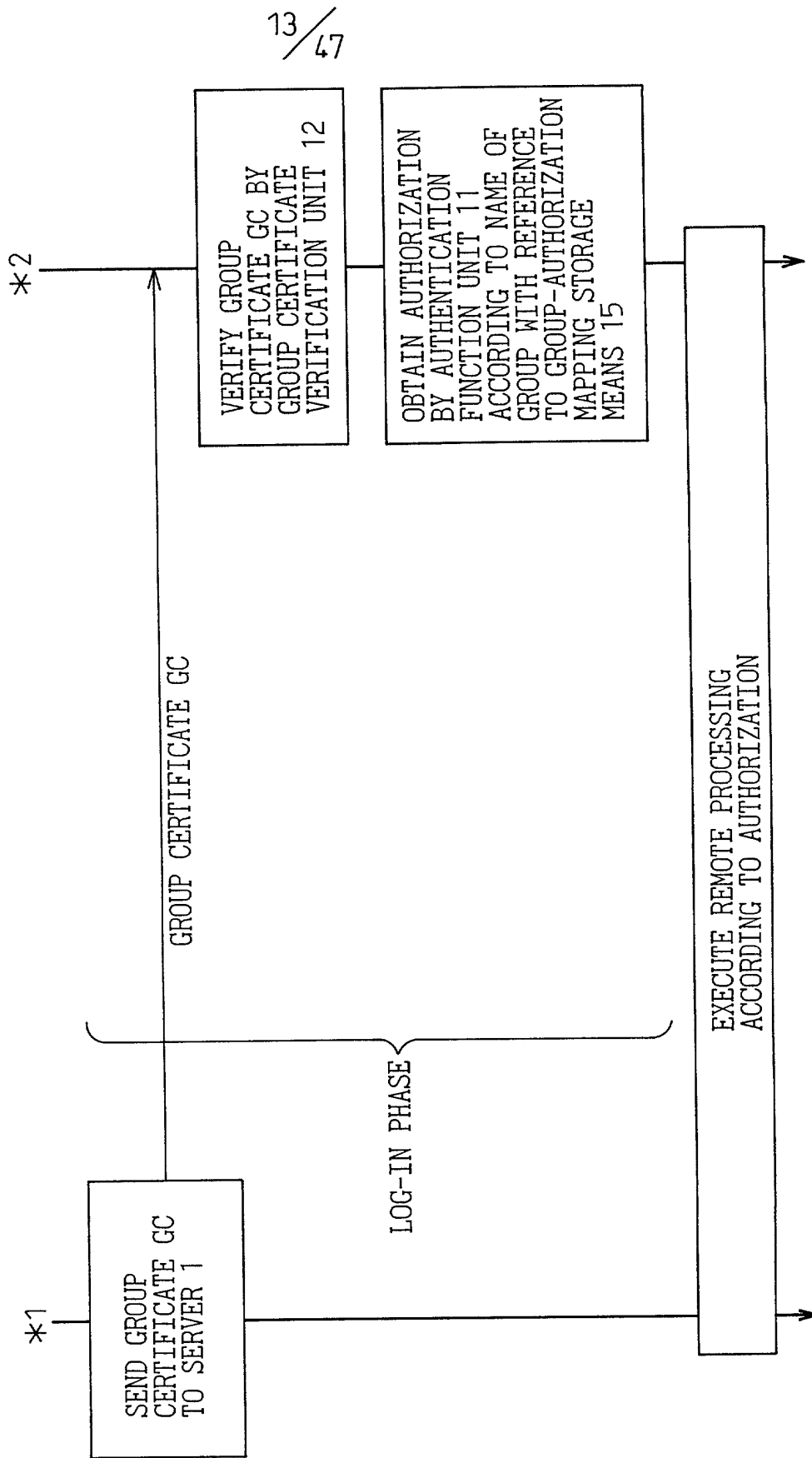


Fig.16

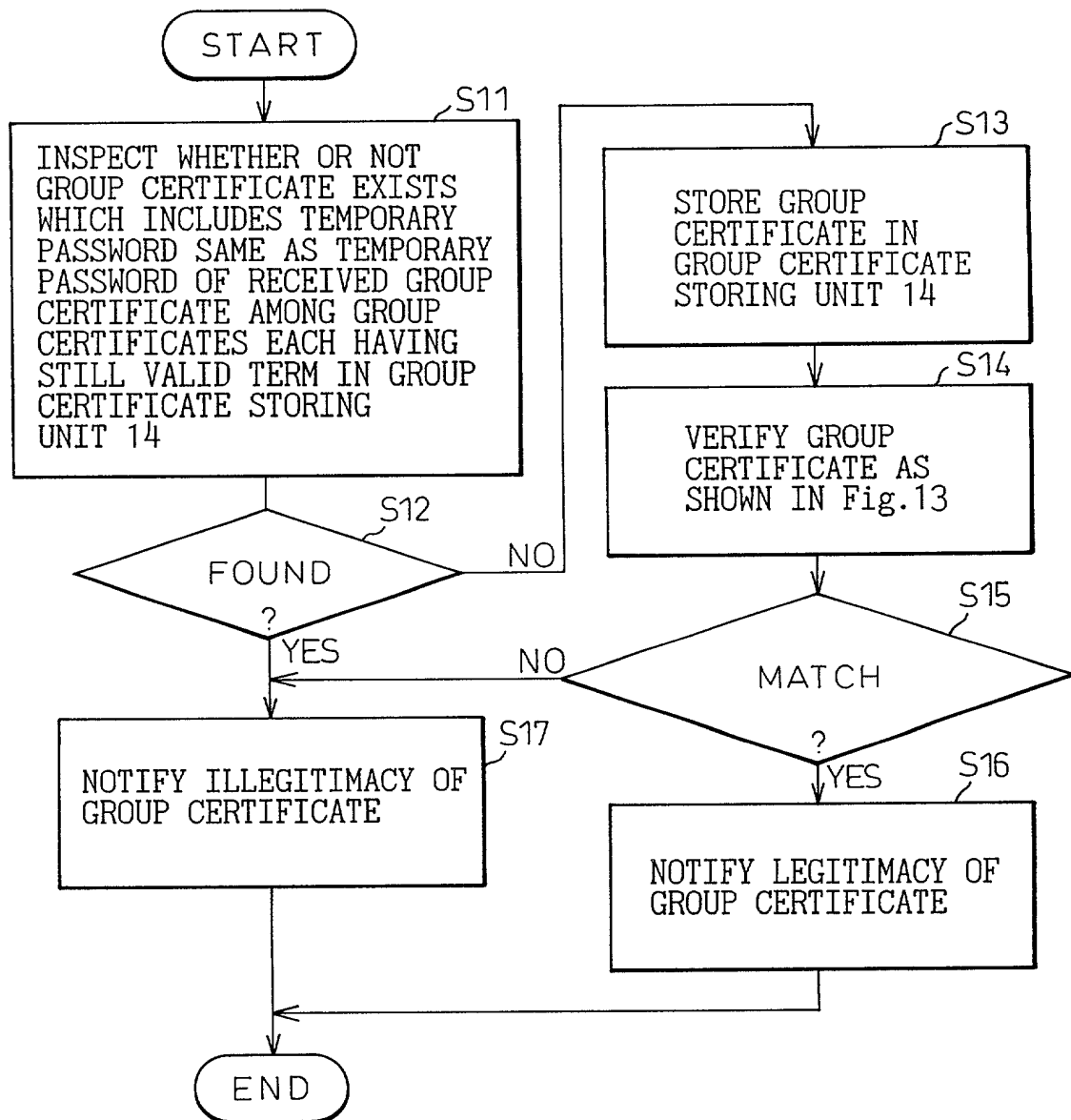


Fig.17

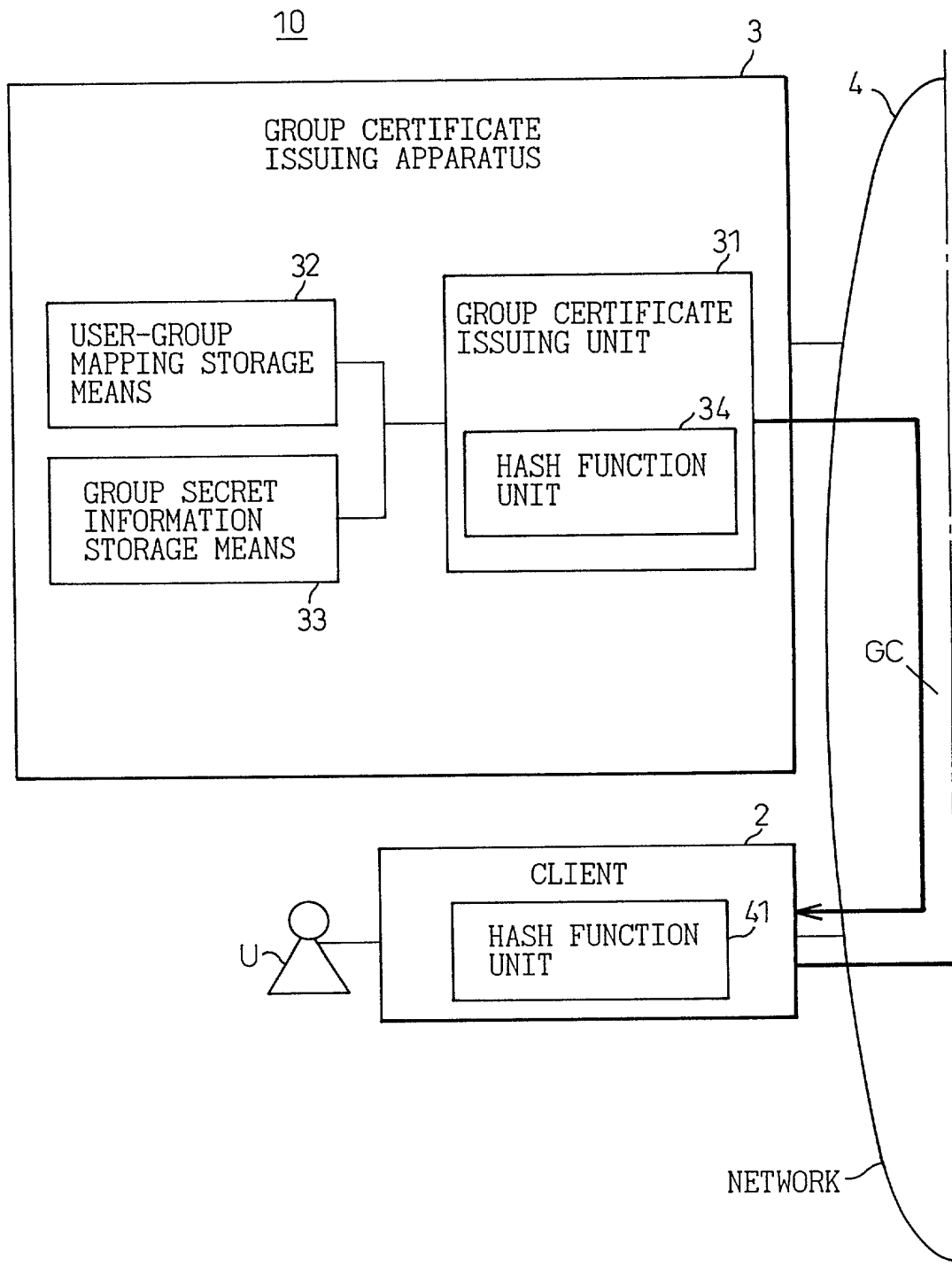


Fig.18

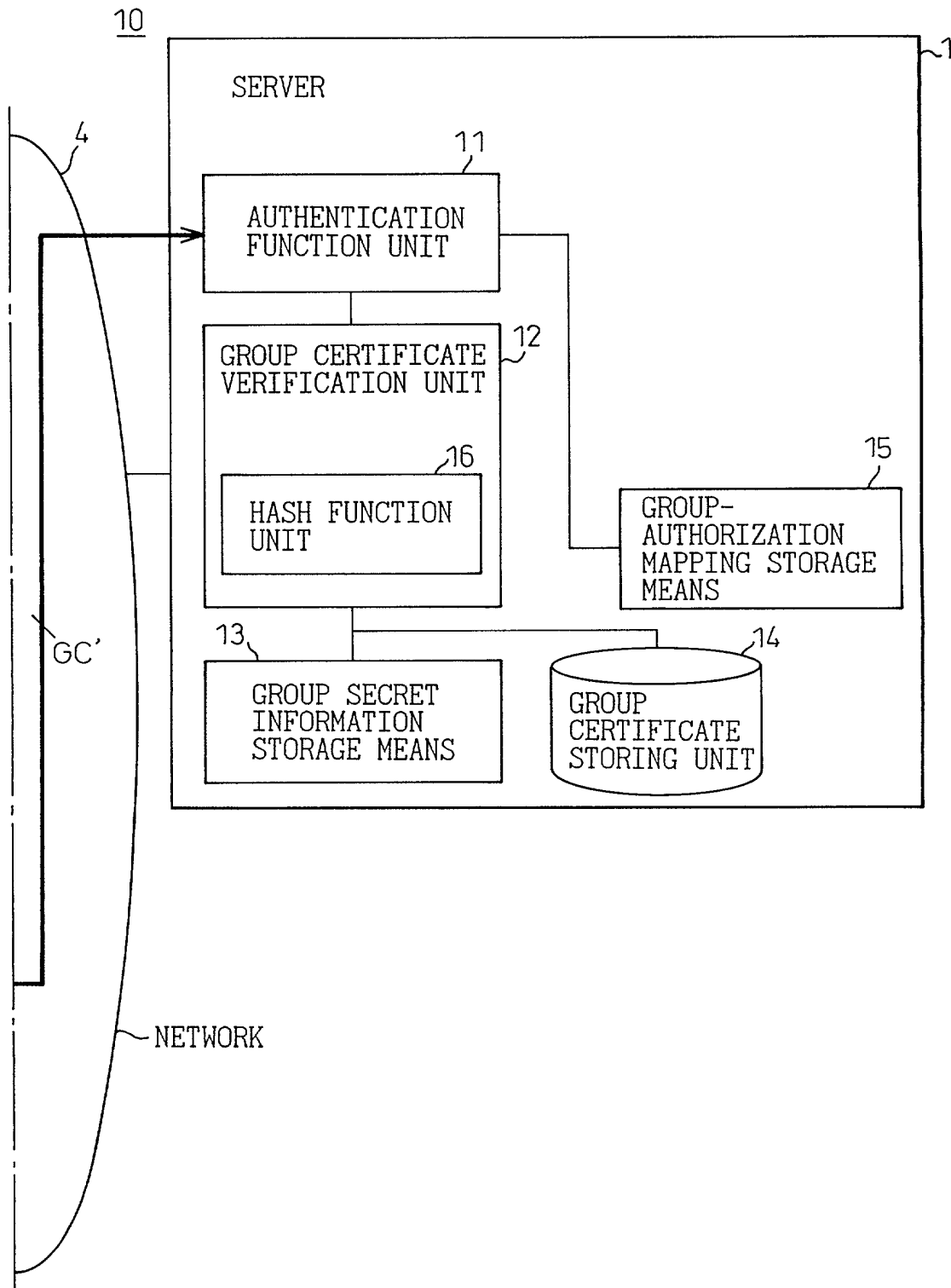
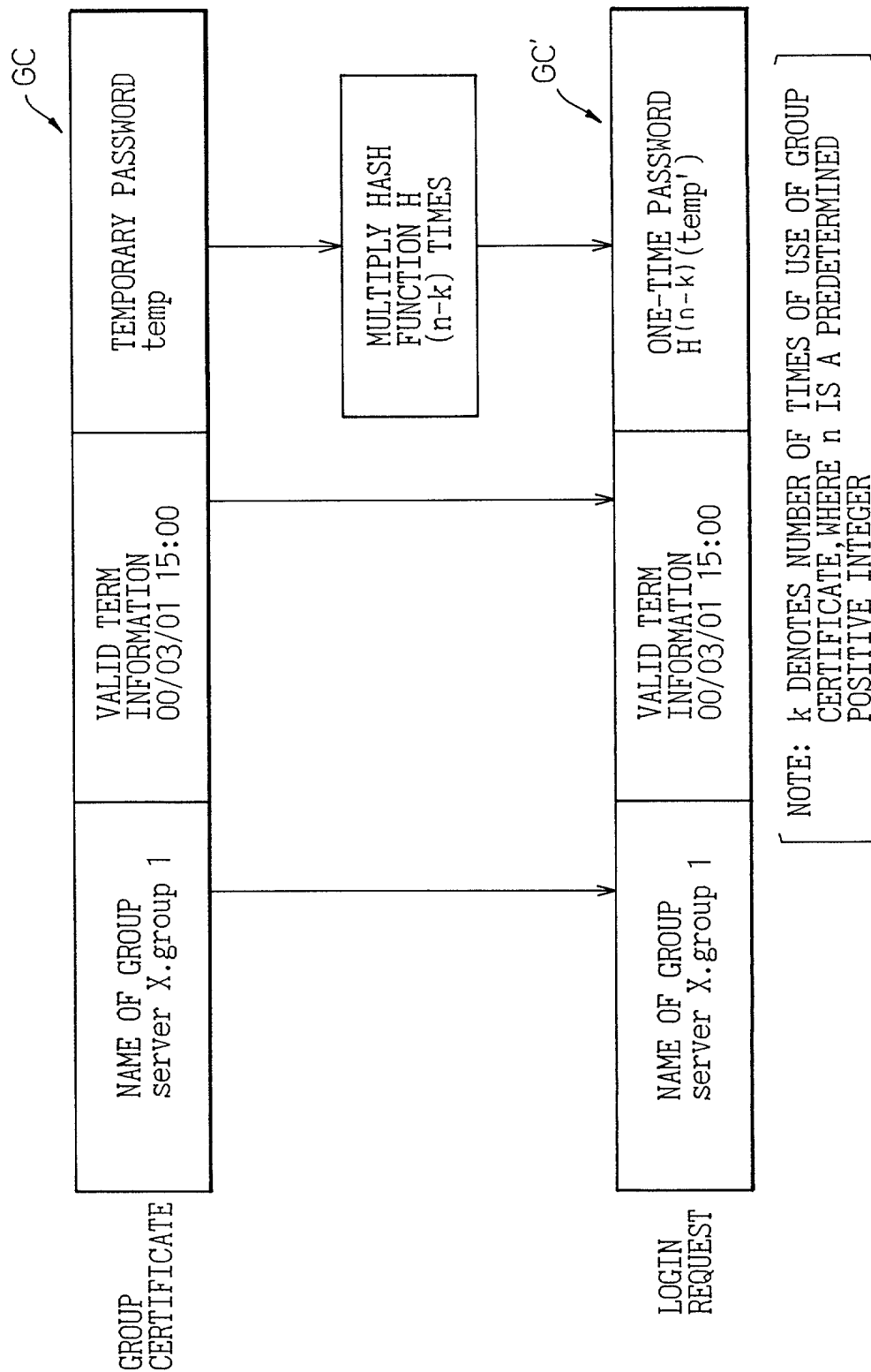


Fig.19



# Fig.20

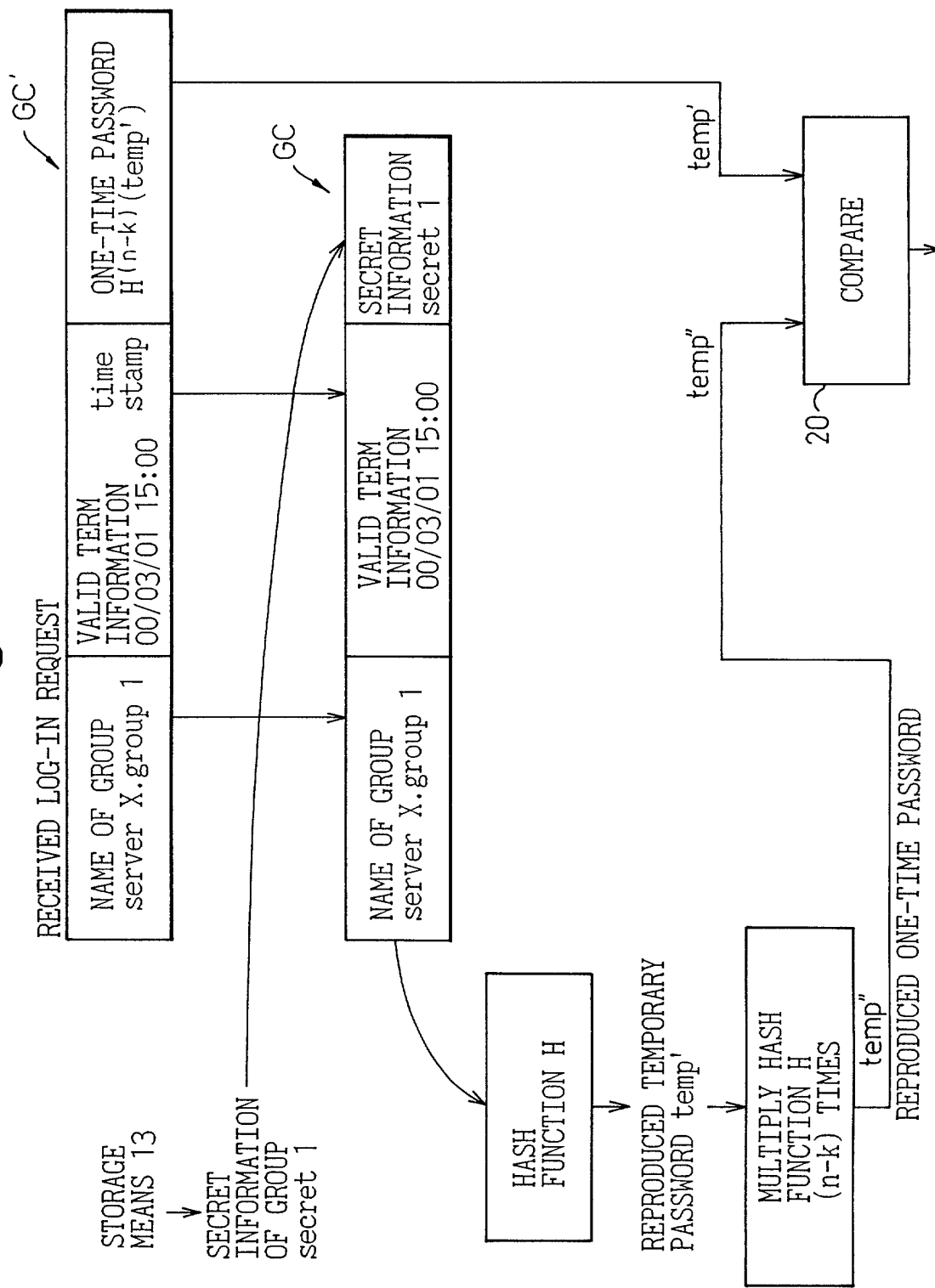


Fig. 21

14

LOG-IN REQUEST GC'				VALUE OF k
NAME OF GROUP	VALID TERM INFORMATION	time stamp	ONE-TIME PASSWORD temp'	
server X.group 1	00/03/01	15:00	H (n) (temp')	0
server X.group 4	00/03/01	13:00	H (n-4) (temp')	4
server X.group 2	00/03/01	14:00	H (n-6) (temp')	6
⋮	⋮	⋮	⋮	⋮

# Fig. 22

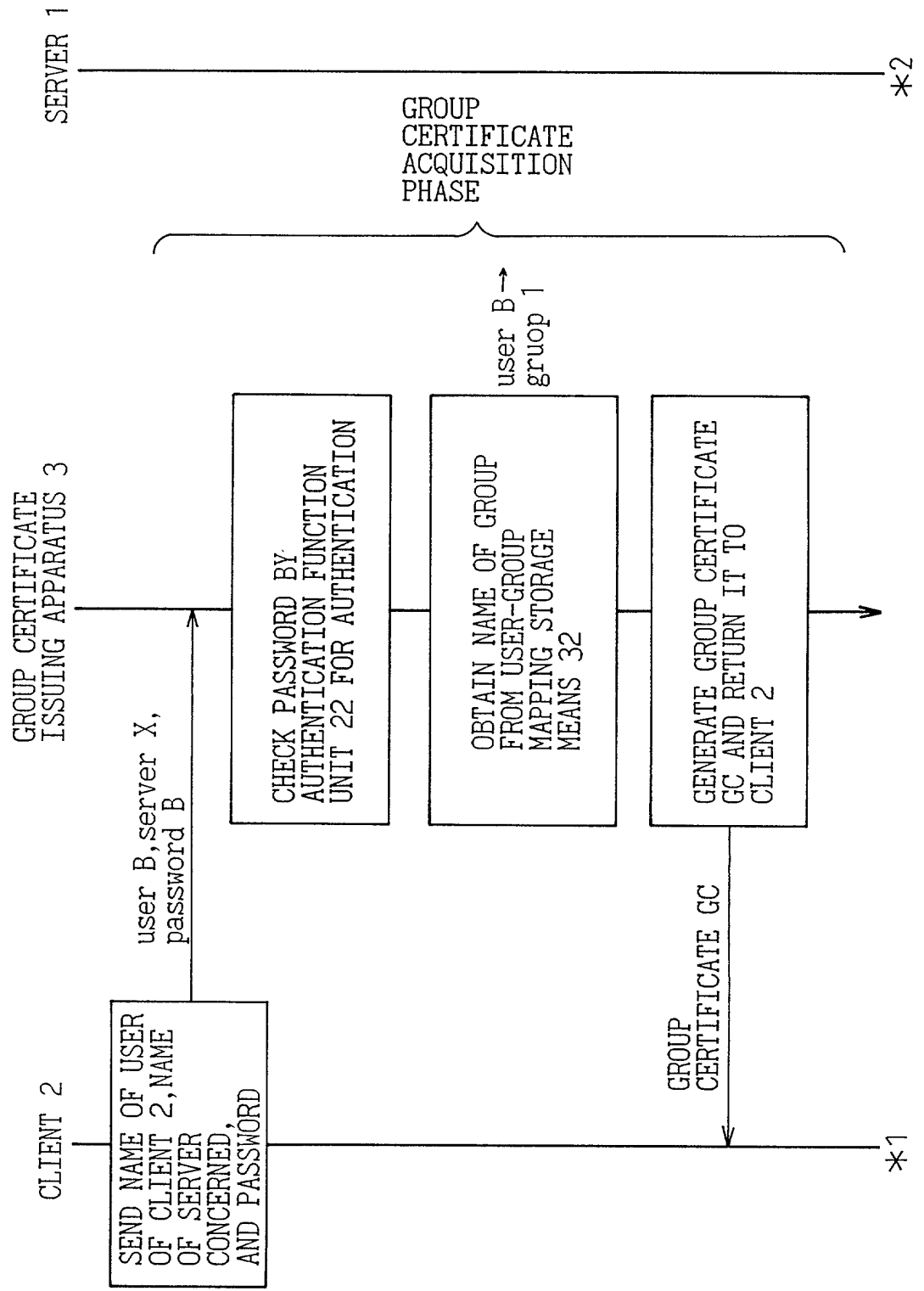


Fig. 23

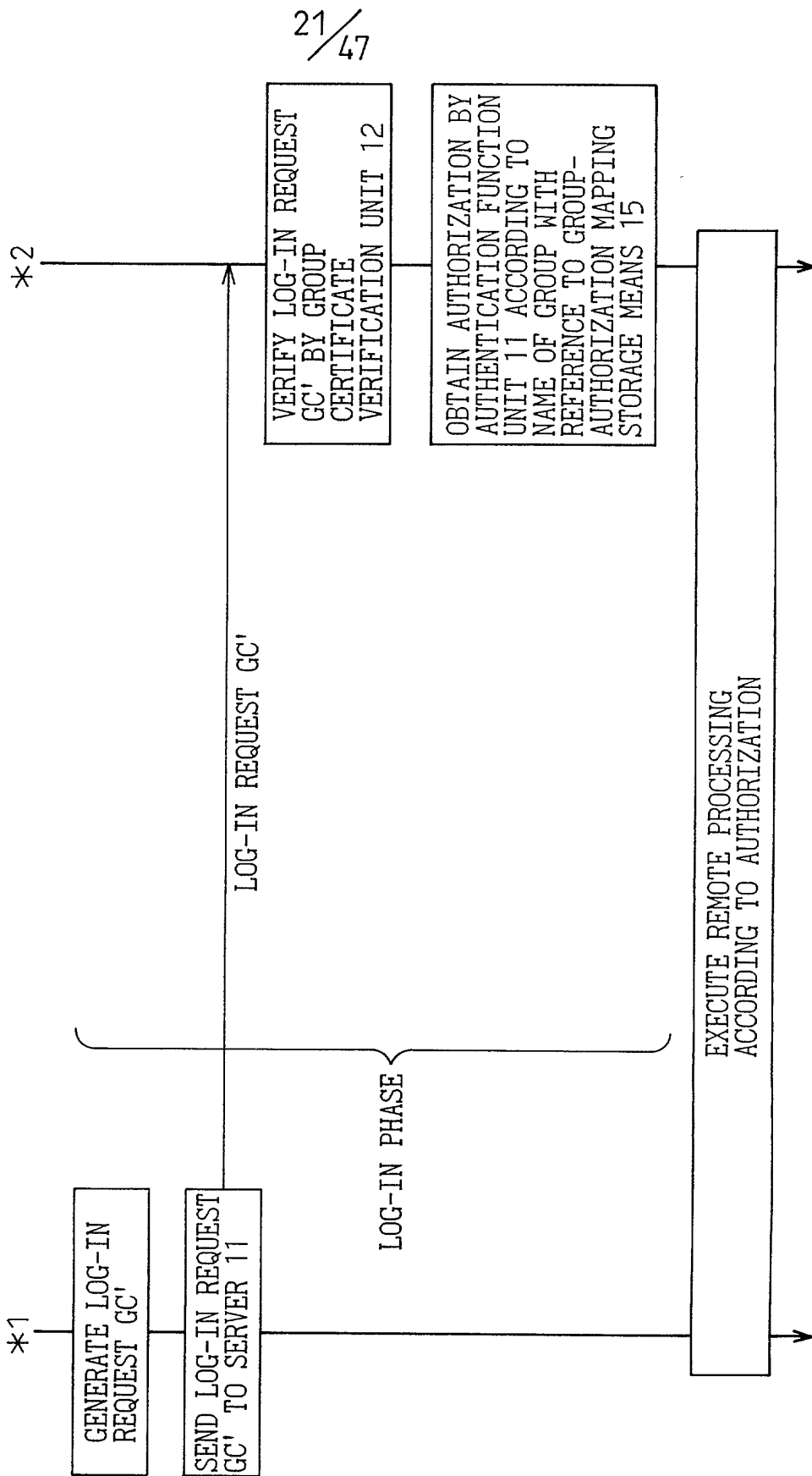


Fig.24

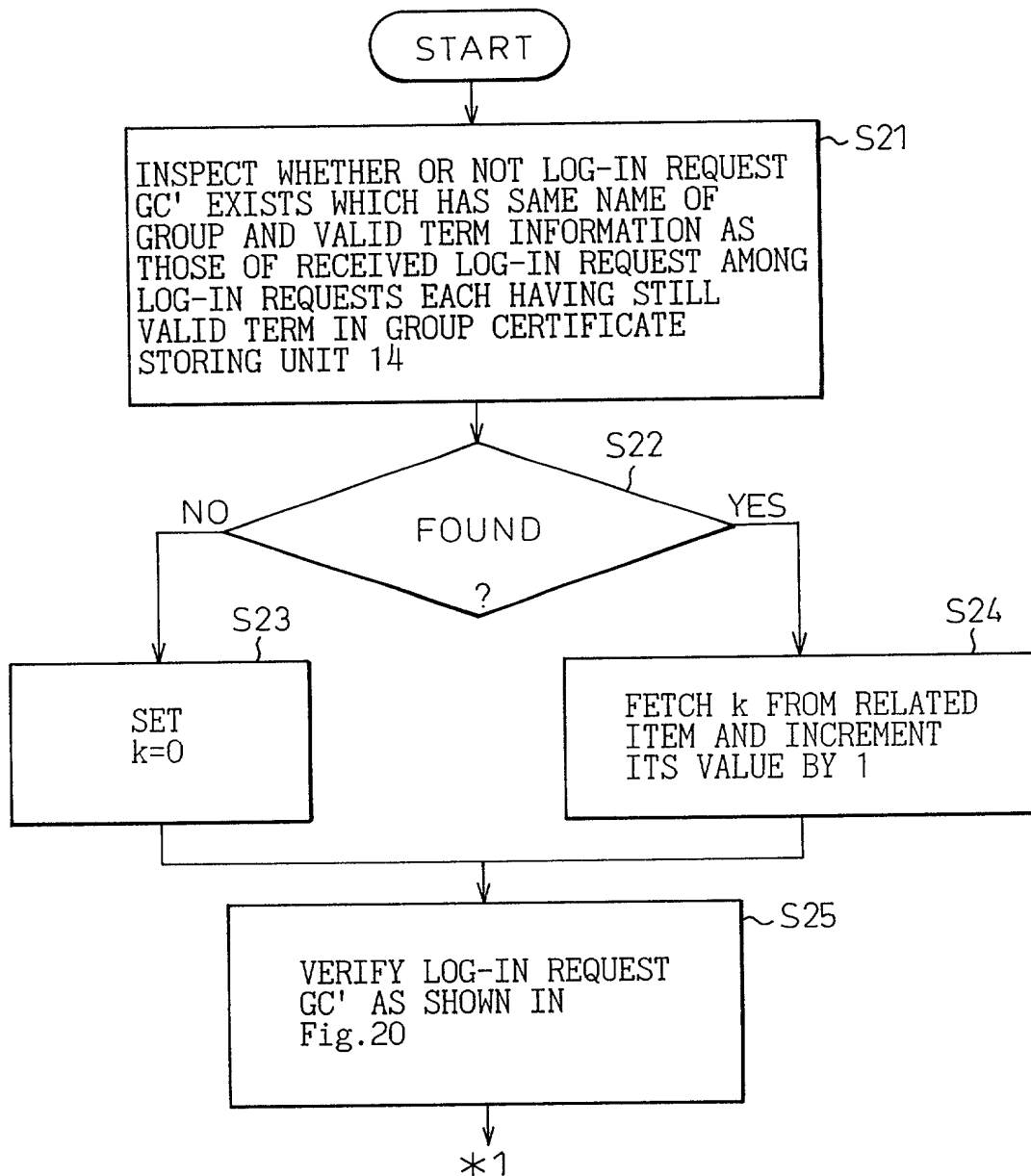


Fig. 25

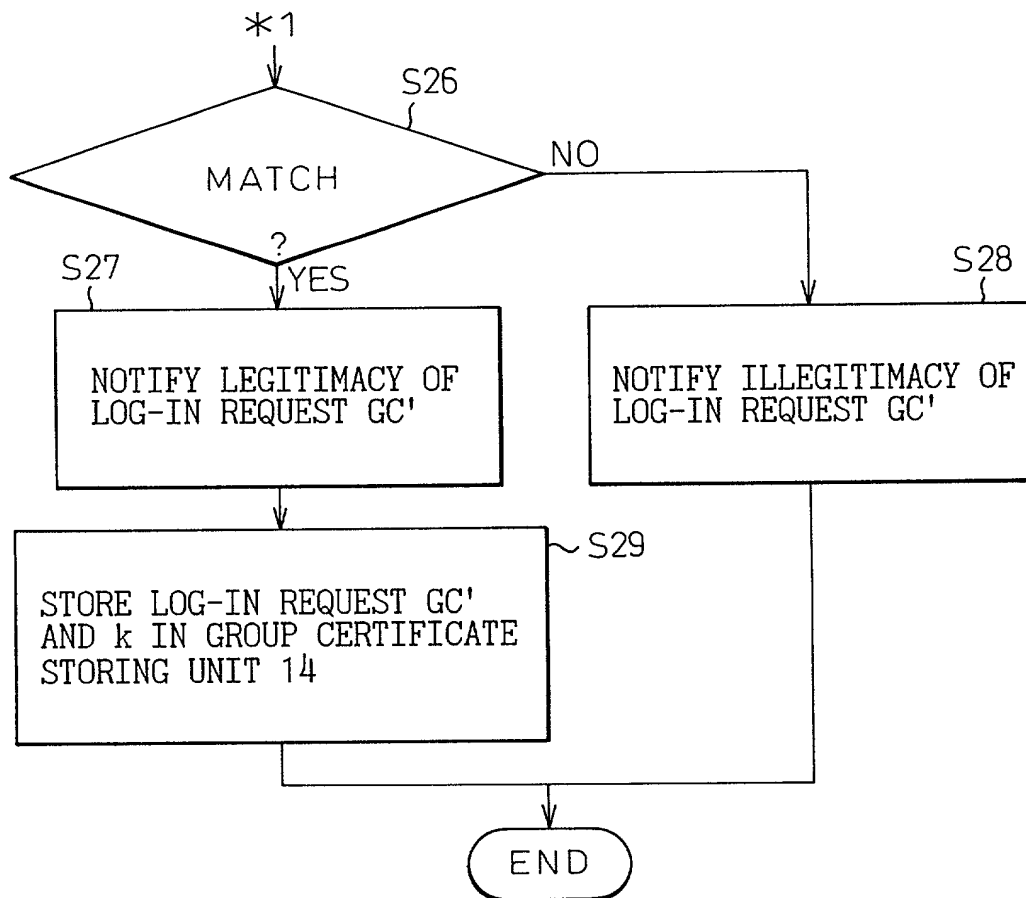


Fig.26

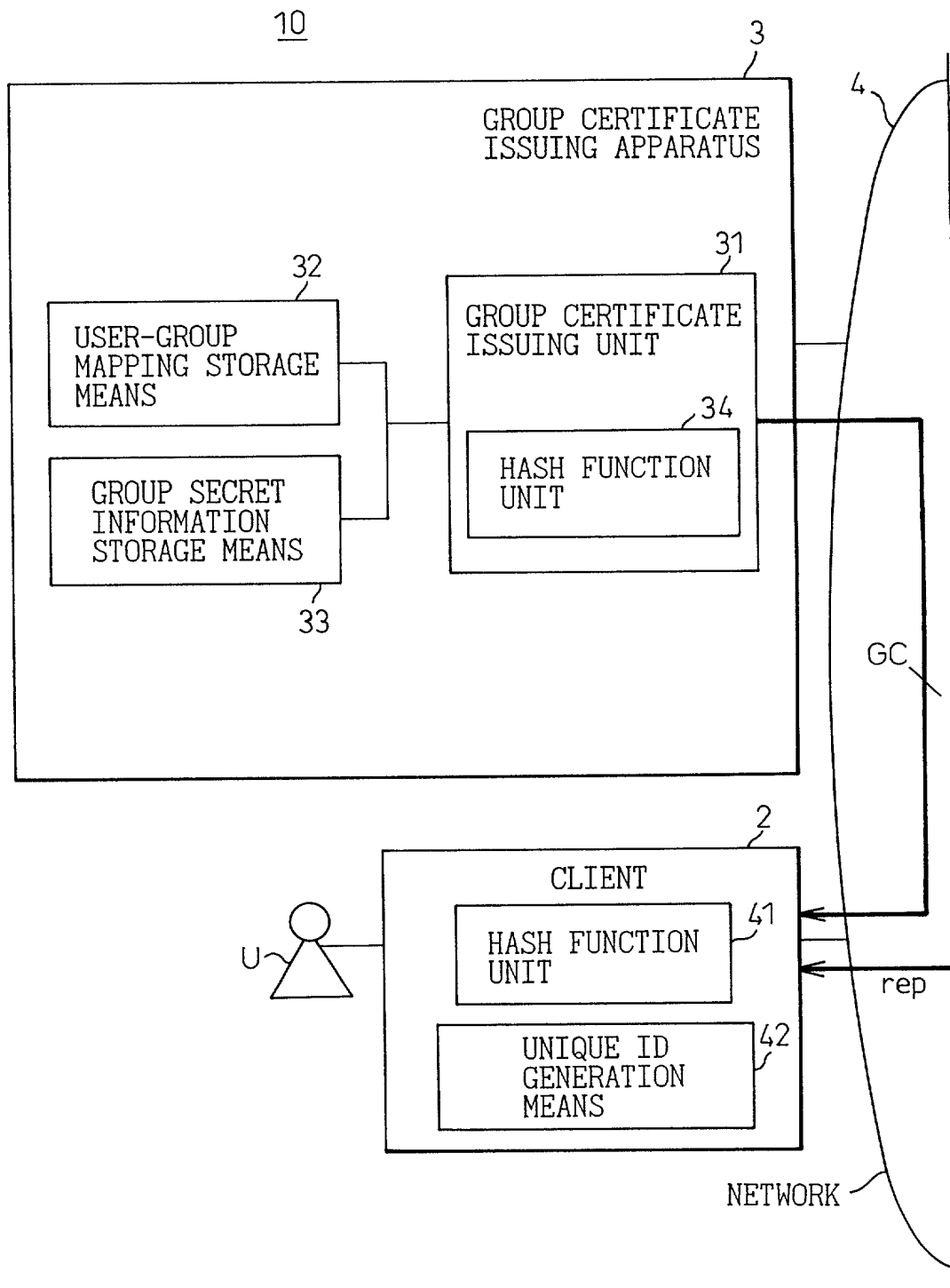


Fig. 27

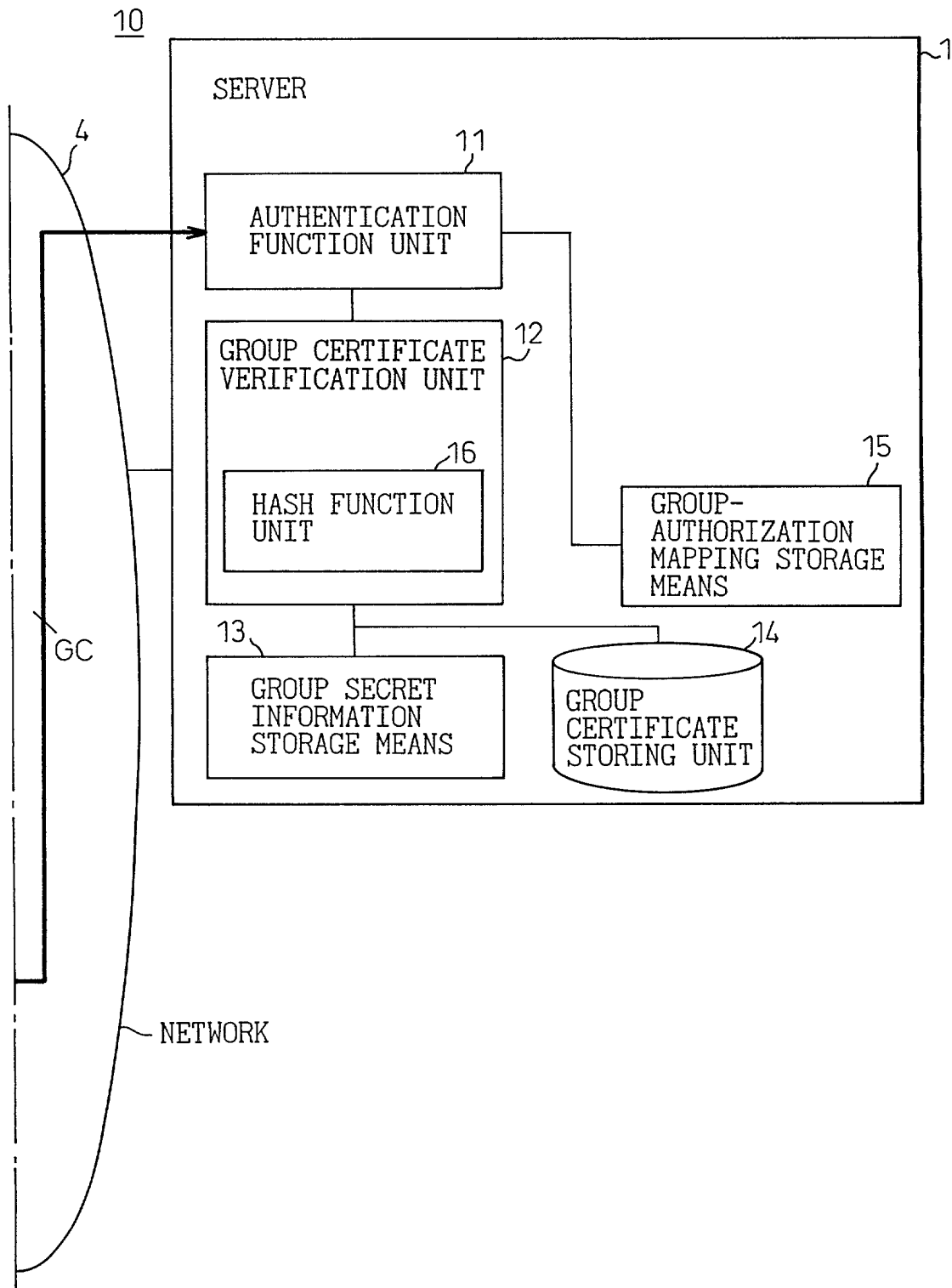


Fig. 28

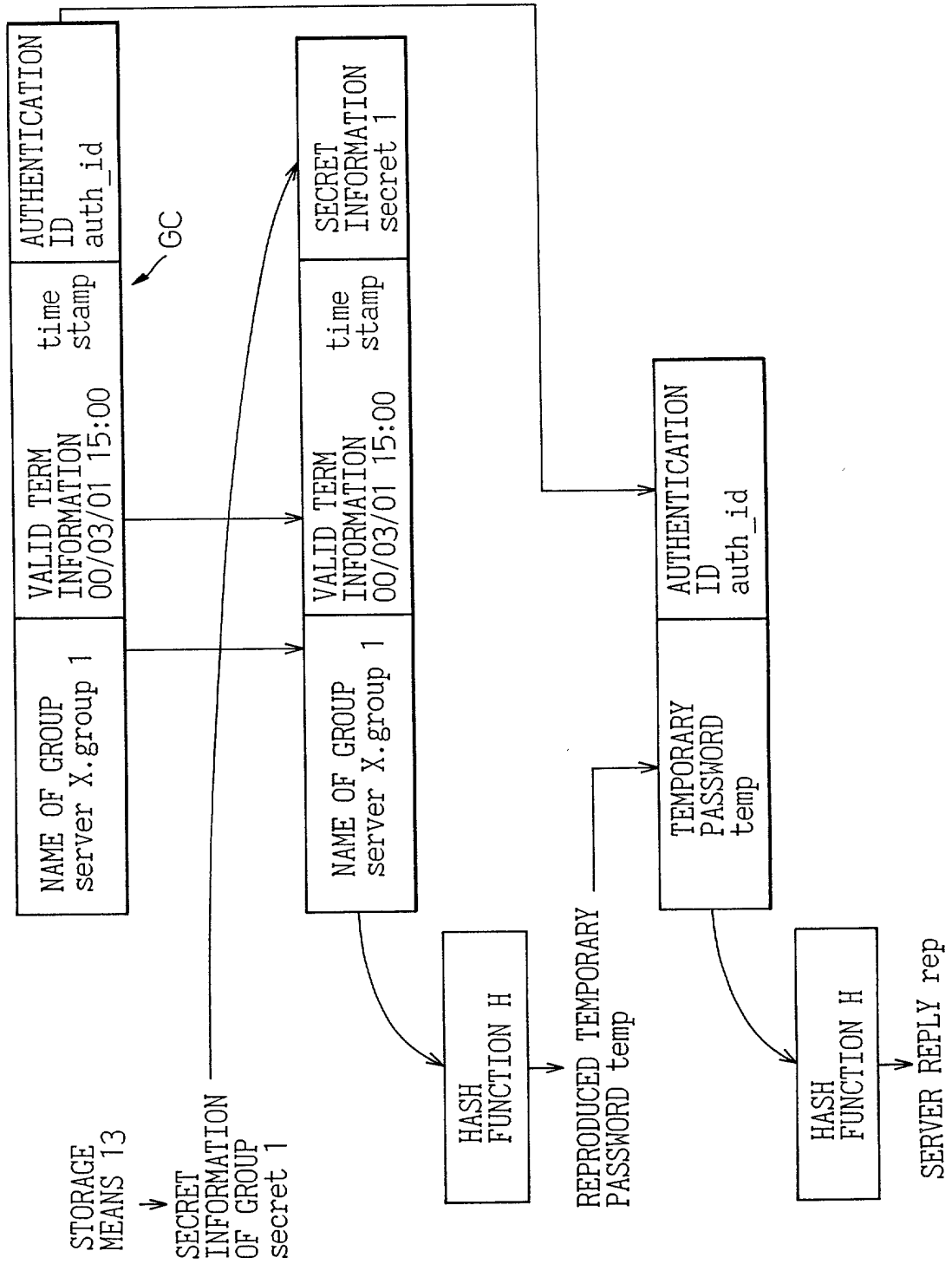


Fig. 29

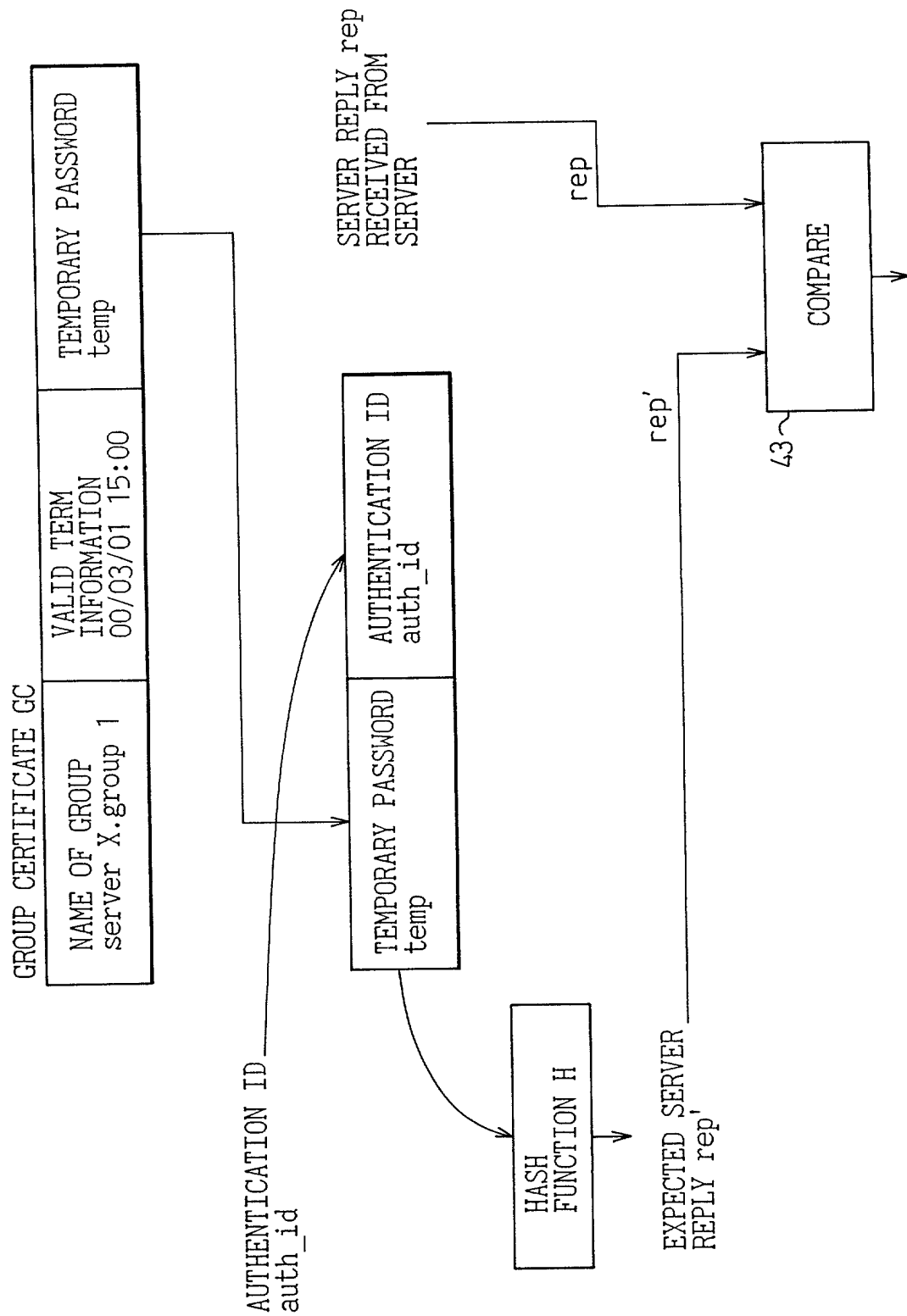


Fig. 30

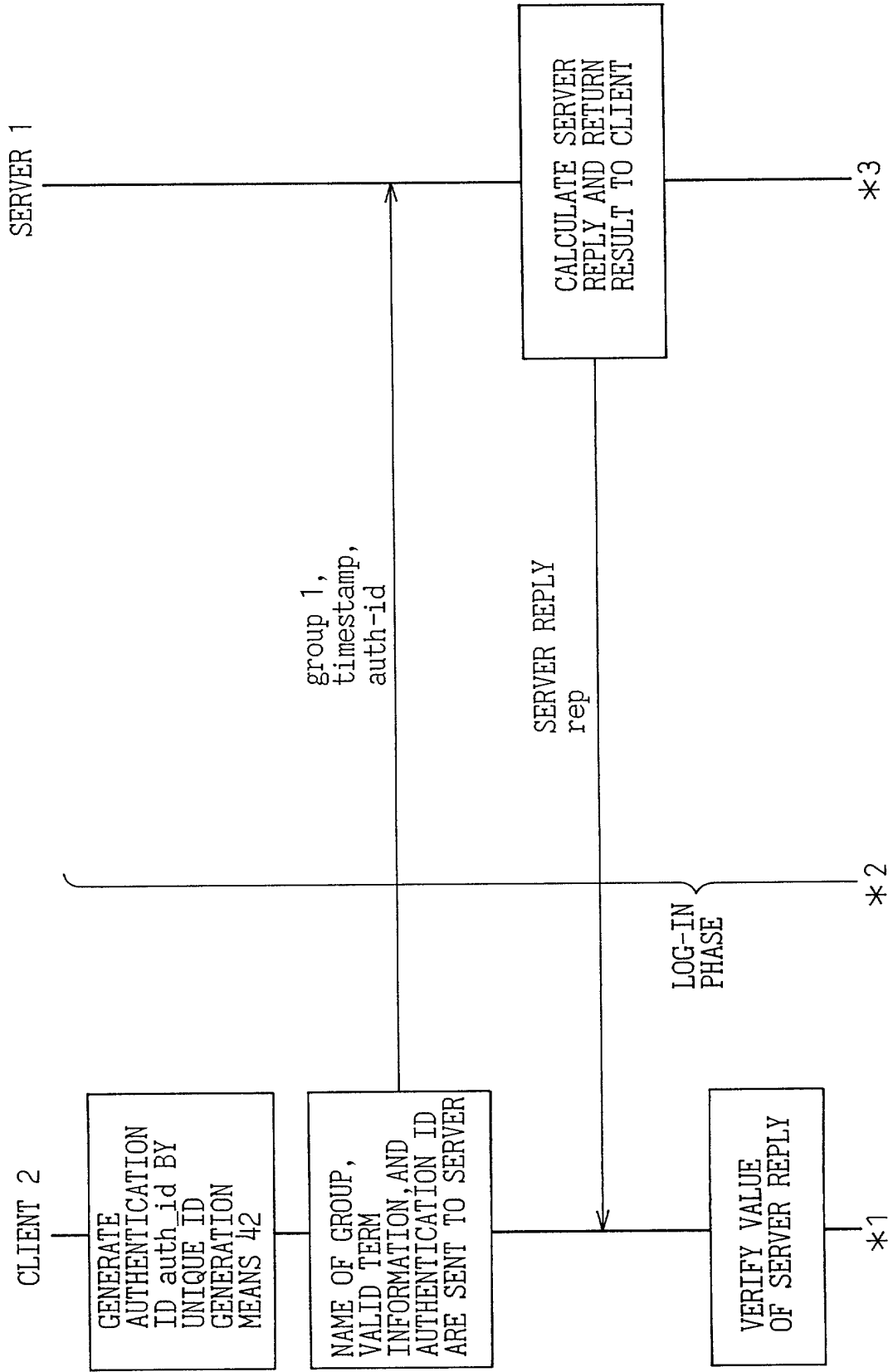


Fig. 31

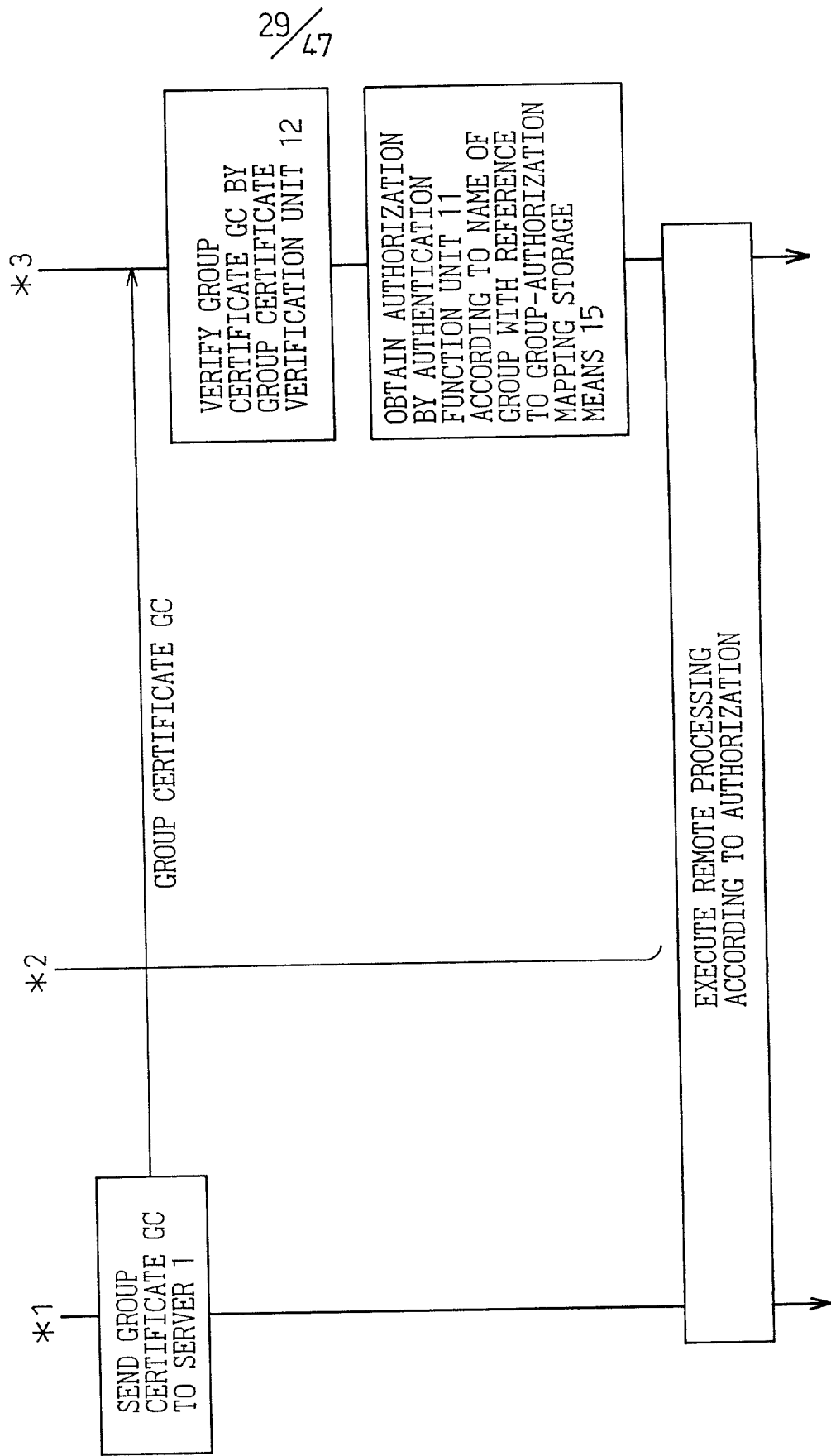


Fig. 32

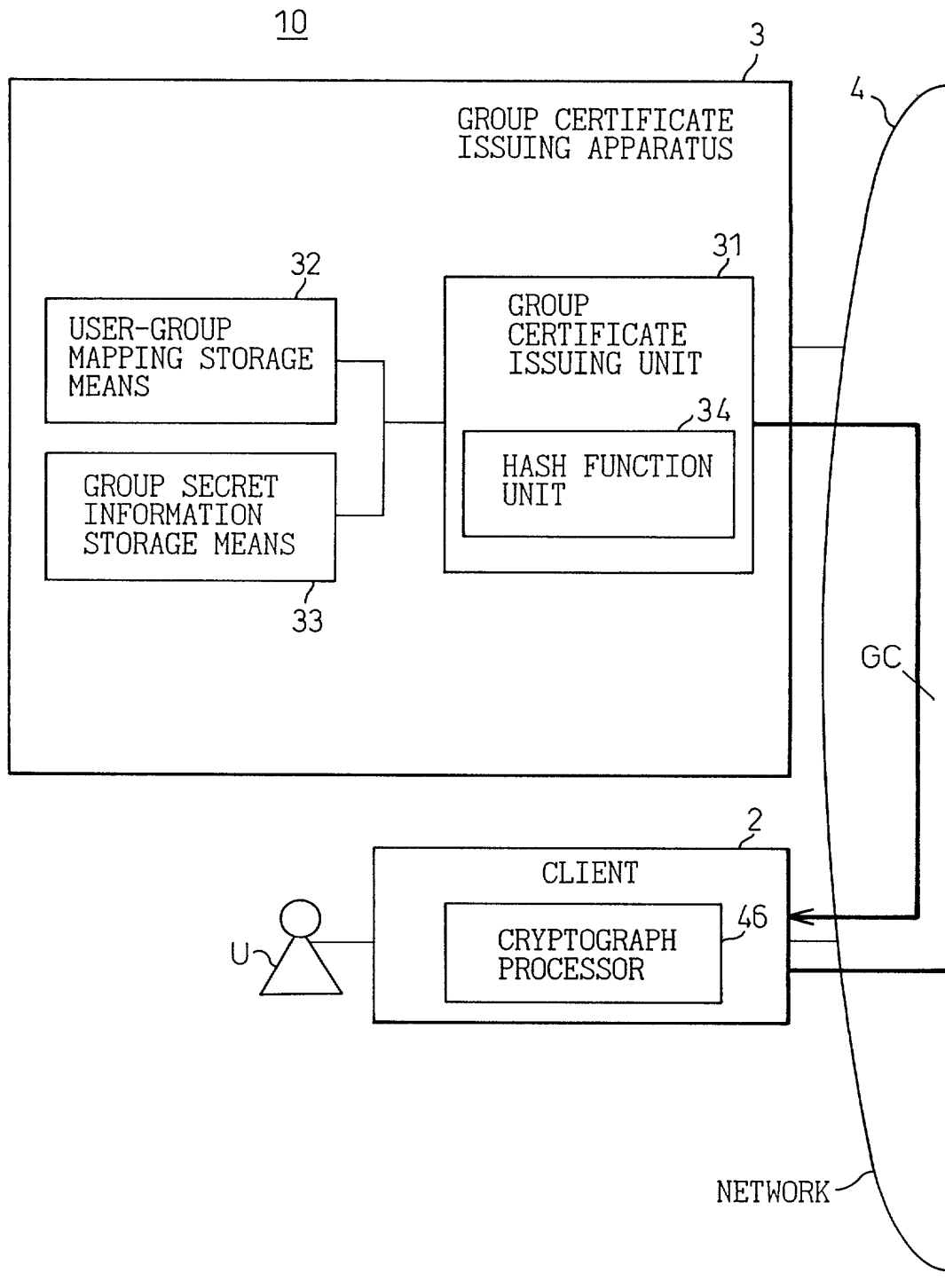


Fig. 33

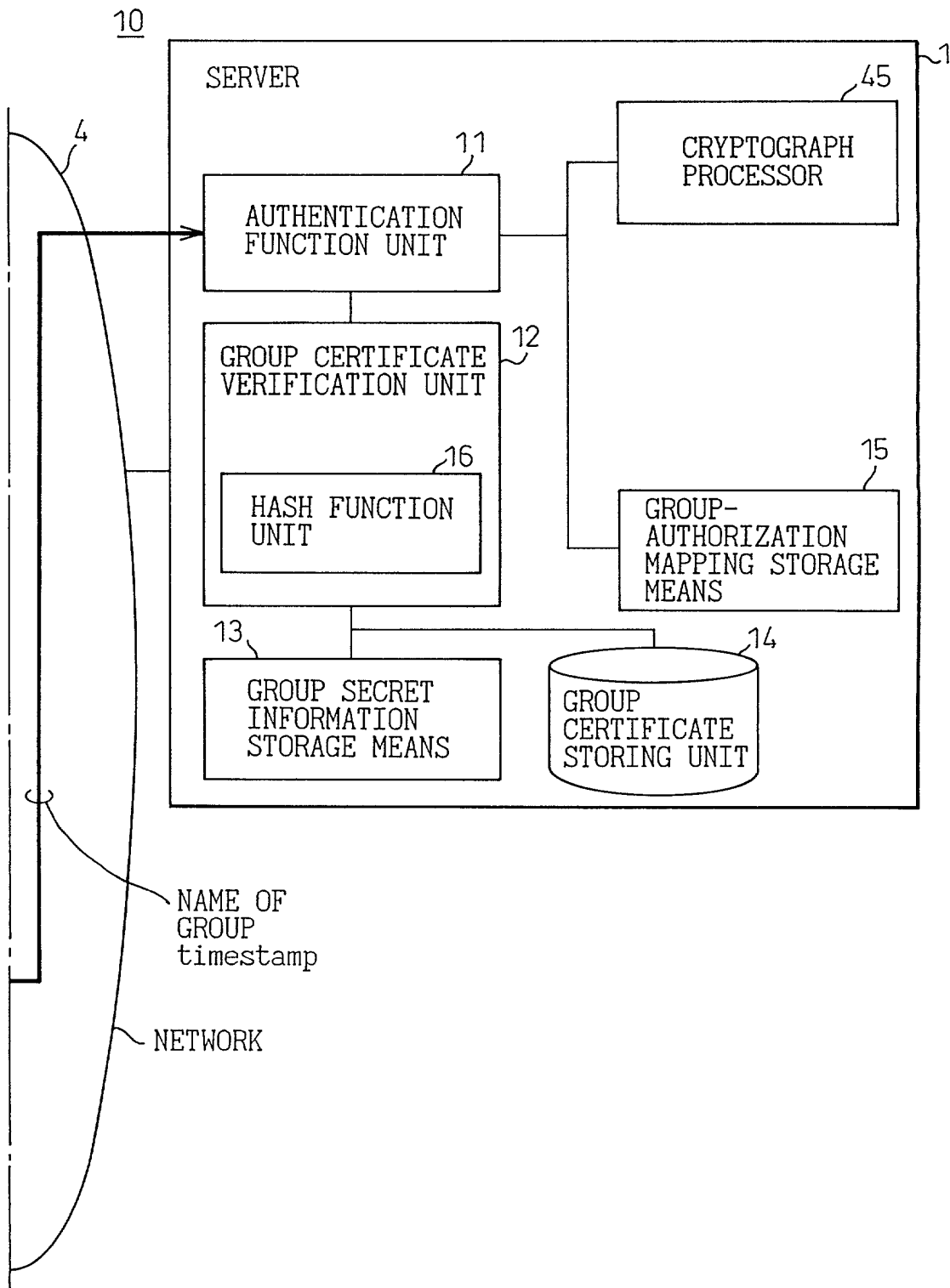


Fig. 34

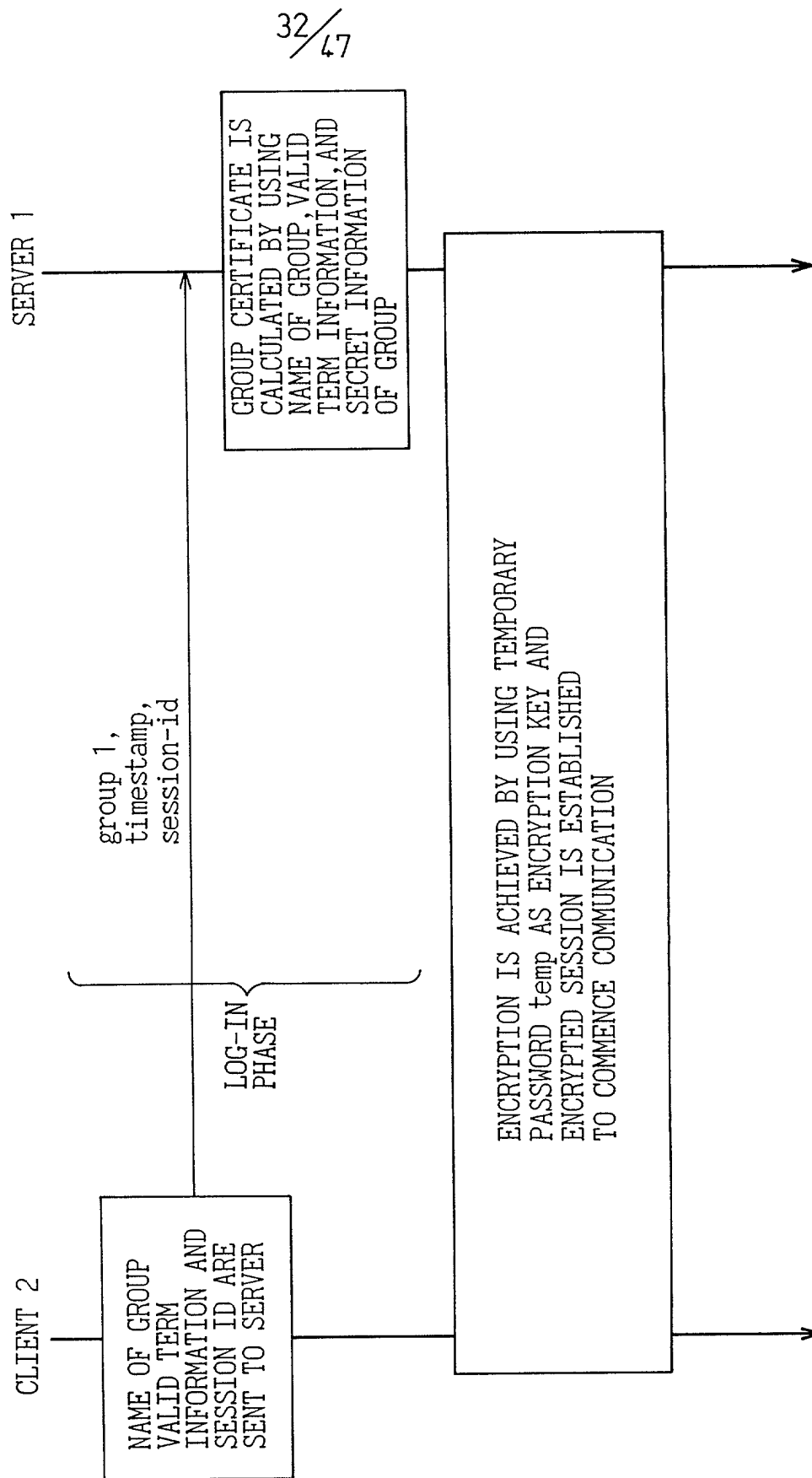


Fig. 35

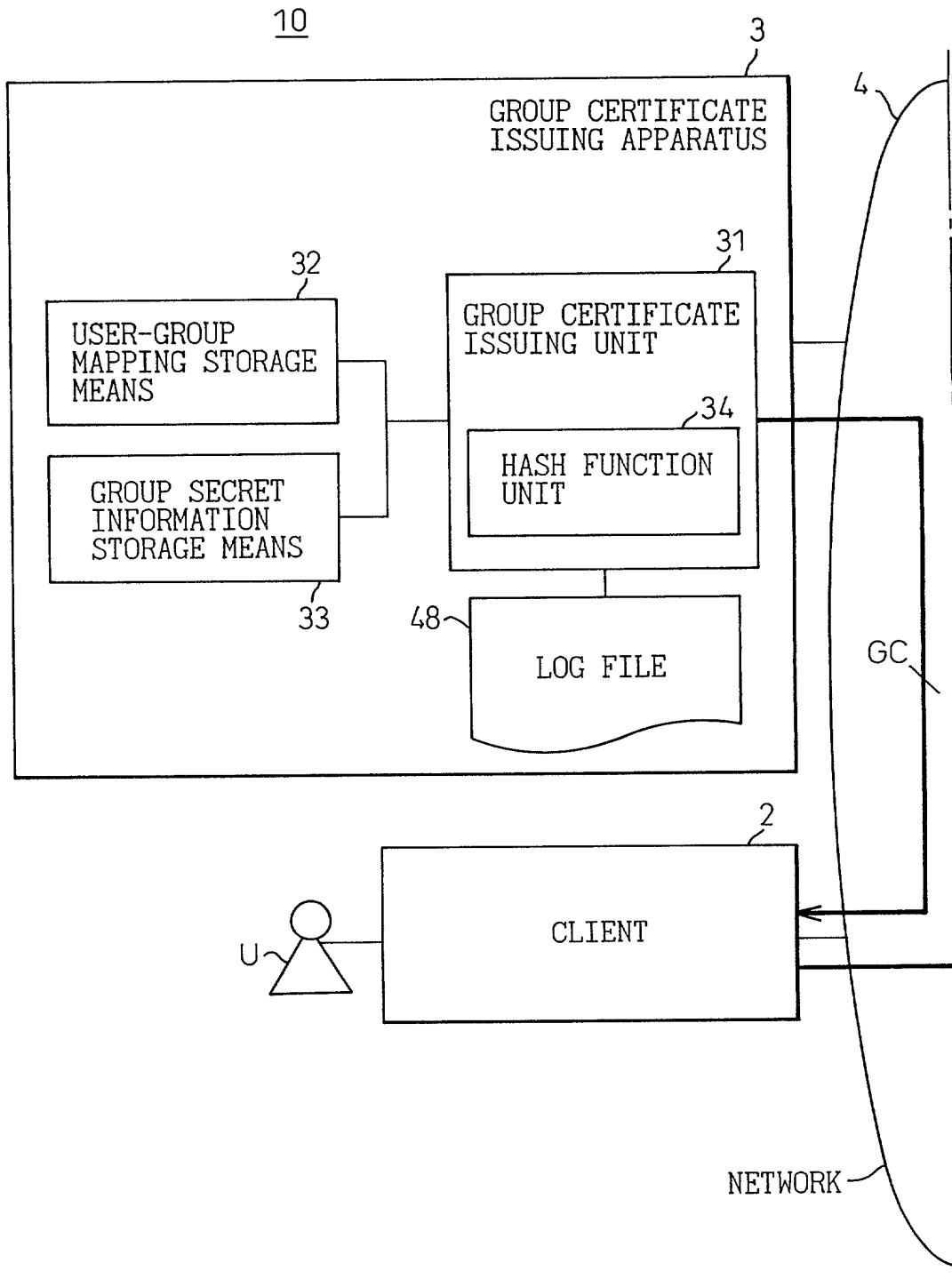


Fig.36

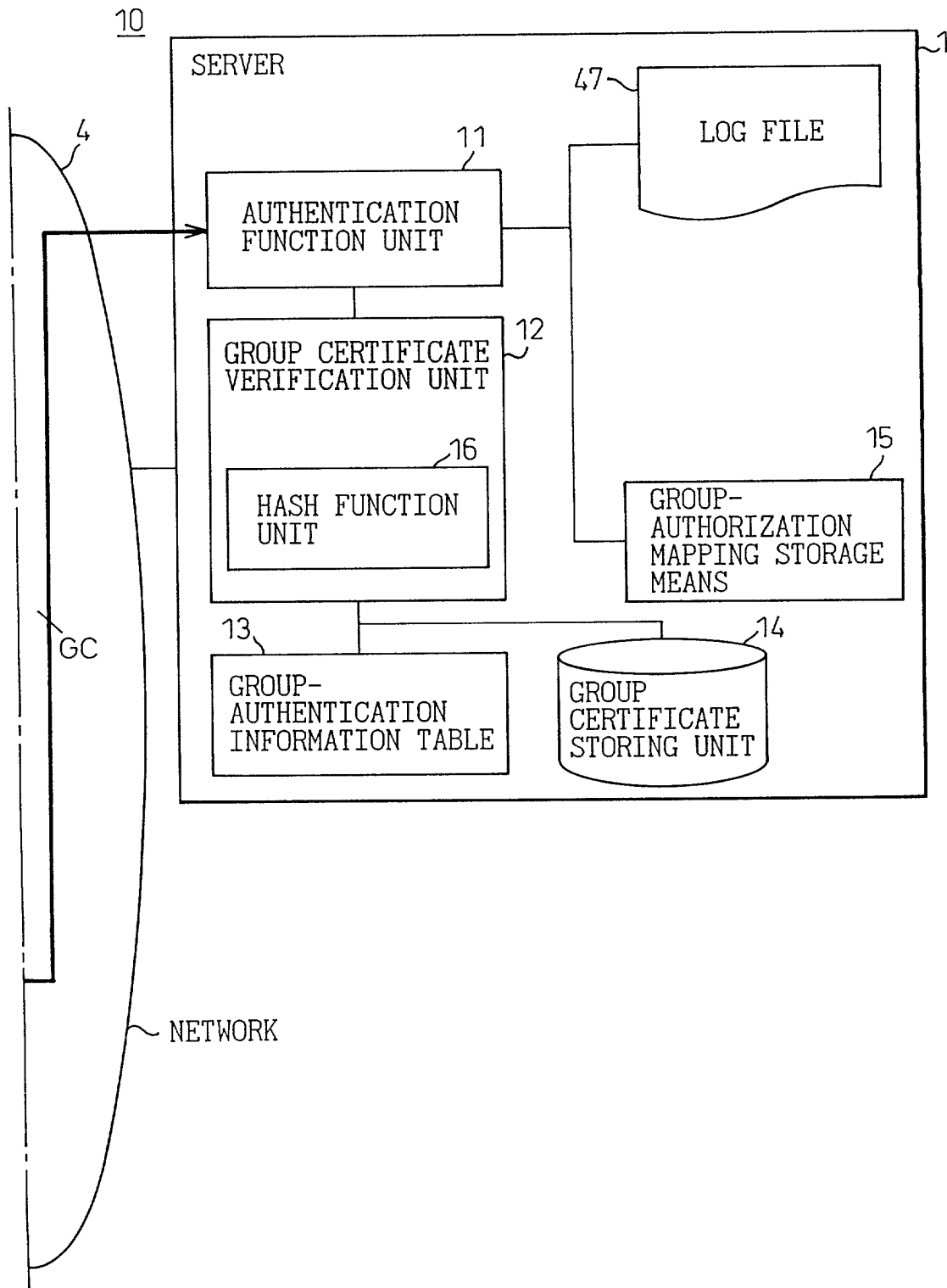


Fig. 37

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# LOG FILE OF GROUP CERTIFICATE ISSUING APPARATUS

ISSUING AFFAIRS					
ISSUE DATE AND TIME	USER	SERVER	GROUP	VALID TERM INFORMATION	TEMPORARY PASSWORD temp
00/03/01 09:42	user A	server X	group 2	00/03/01 13:00	2983301136
00/03/01 10:25	user B	server X	group 1	00/03/01 15:00	4023502123
:	:	:	:	:	:

00/03/01 10:14  
00/03/01 10:25  
:  
00/03/01 12:20  
00/03/01 14:41  
:  
host J  
host K  
:  
group 2  
group 1  
:  
00/03/01 13:00  
00/03/01 15:00  
:  
2983301136  
4023502123  
:

Fig. 38

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LOG FILE OF SERVER

START DATE AND TIME OF PROCESSING	FINISH DATE AND TIME OF PROCESSING	NAME OF CLIENT HOST	GROUP	VALID TERM INFORMATION	TEMPORARY PASSWORD temp
00/03/01 10:14 00/03/01 10:25 : 00/03/01 12:20 00/03/01 14:41 : host J host K : group 2 group 1 : 00/03/01 13:00 00/03/01 15:00 : 2983301136 4023502123 :					

Fig. 39

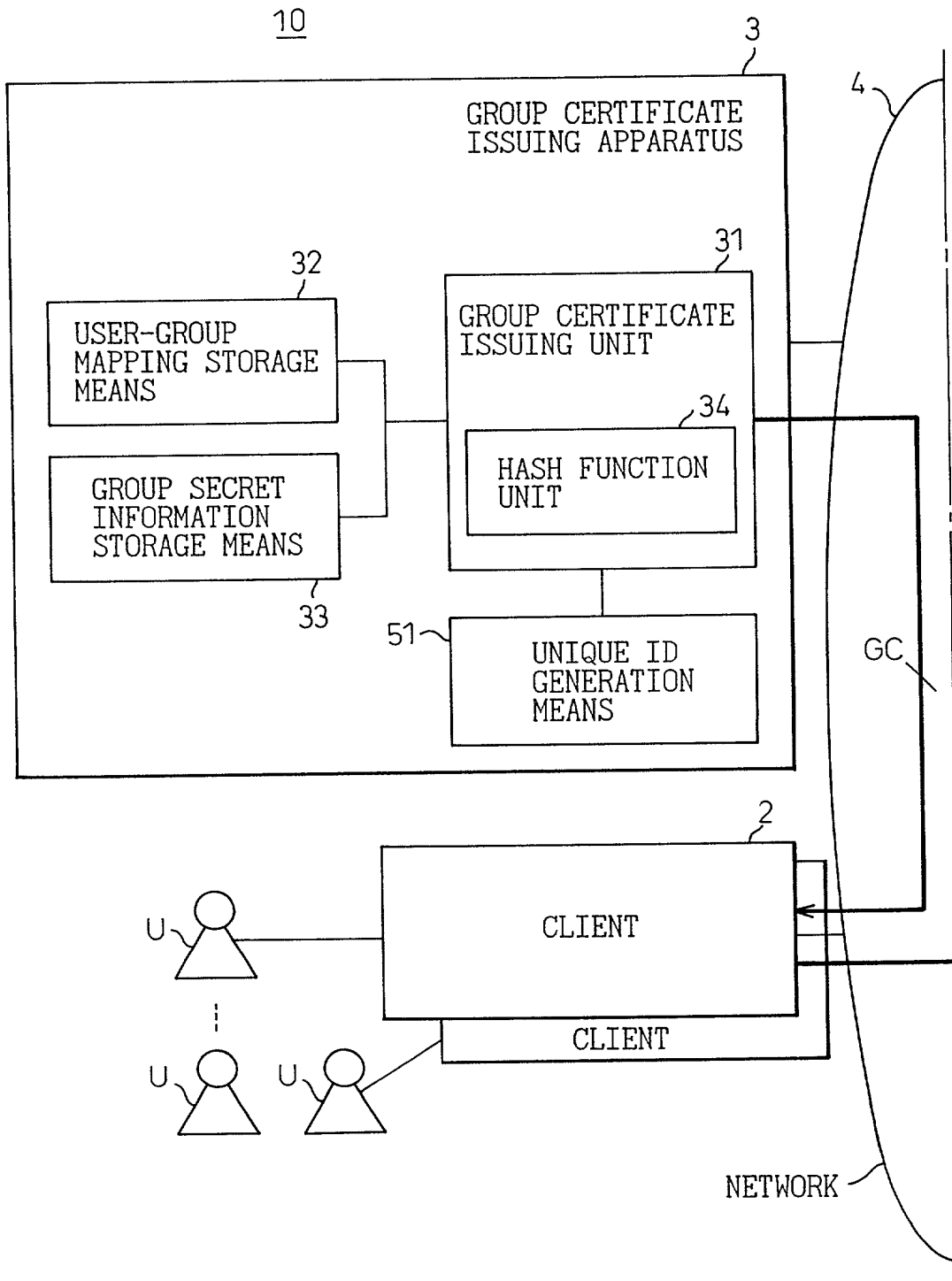


Fig. 40

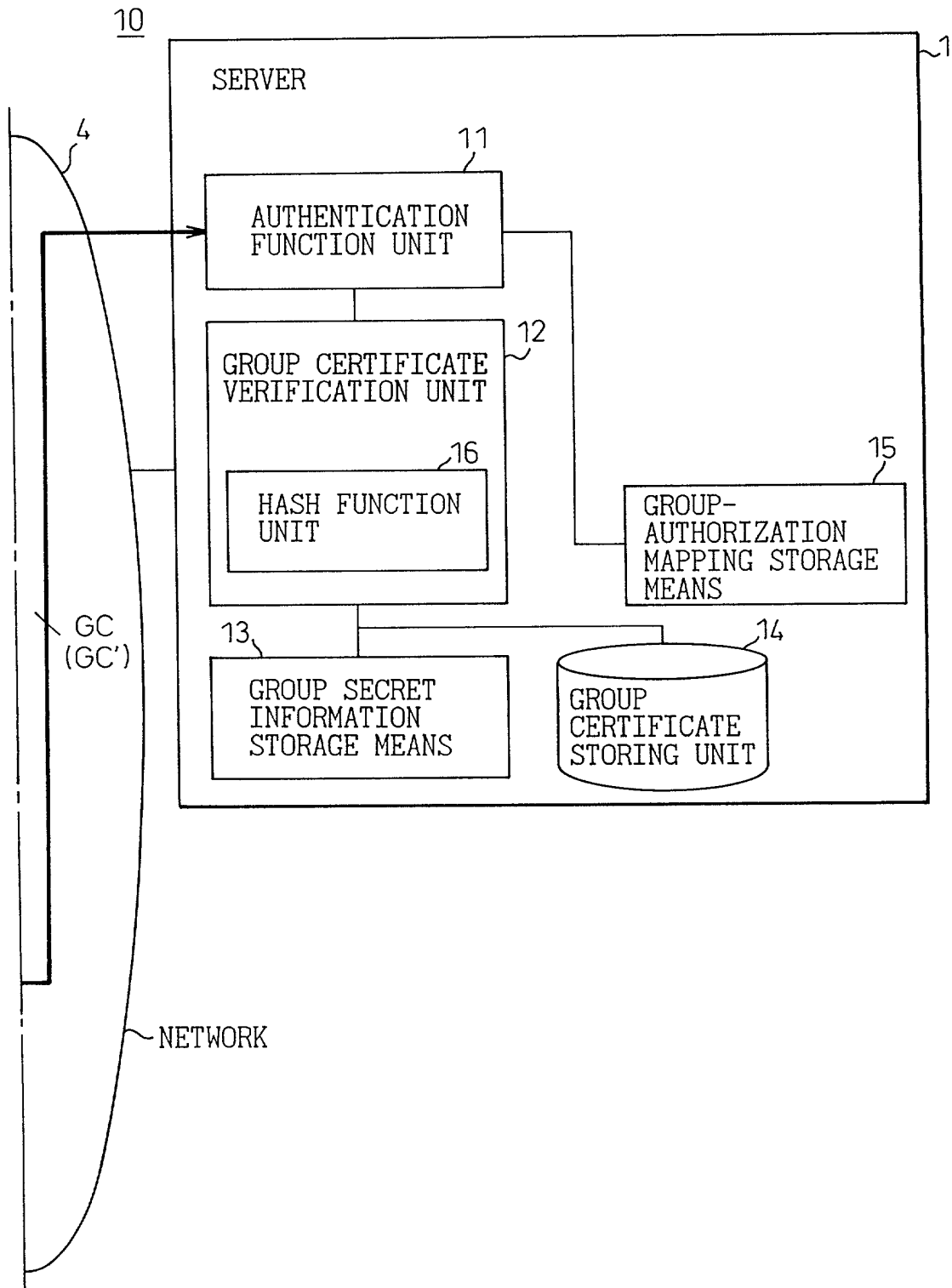
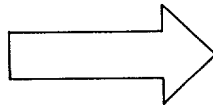


Fig. 41

VALID TERM INFORMATION  
={DATE AND TIME OF VALID TERM}

GC ↗

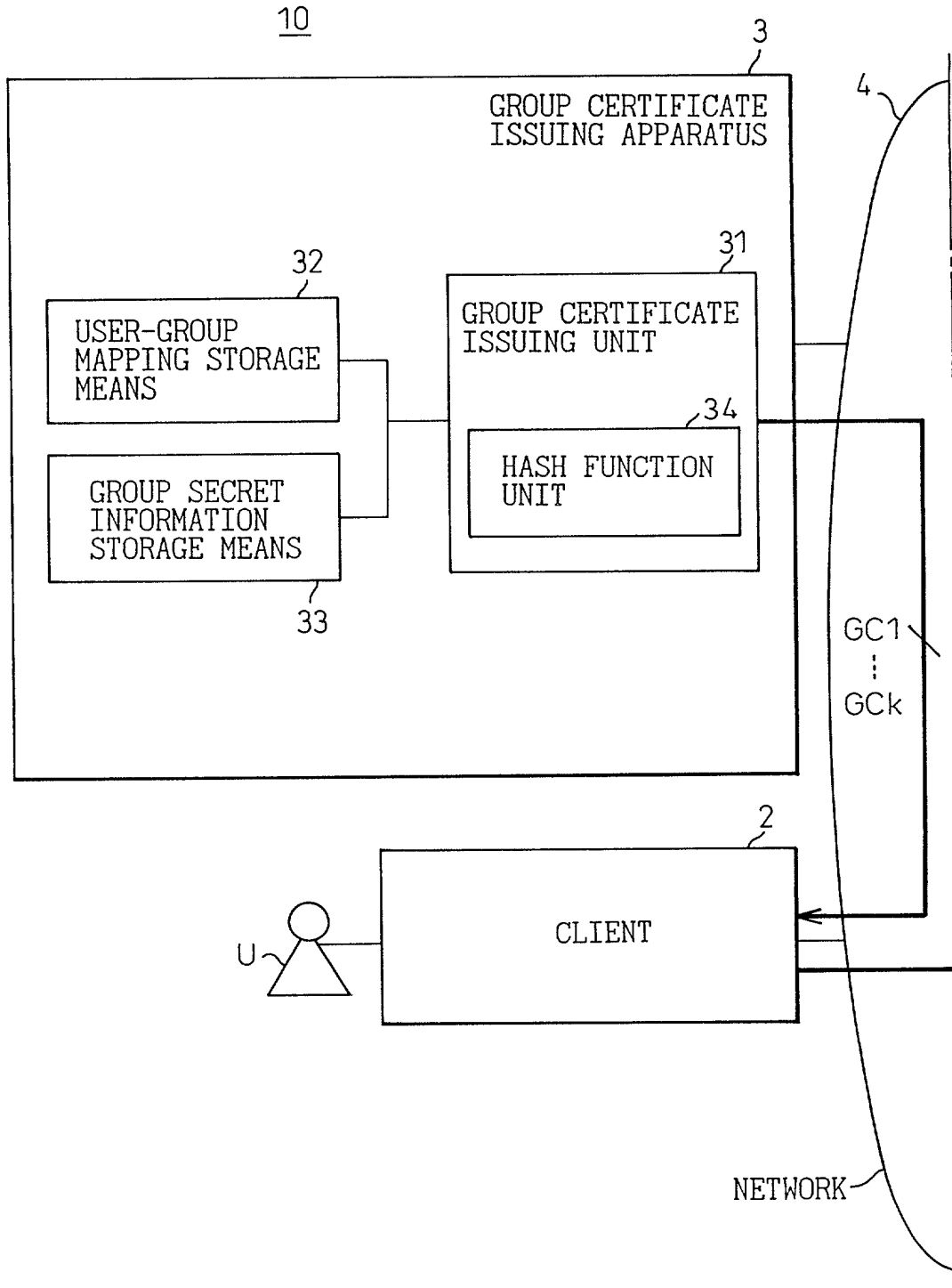
NAME OF GROUP server X.group 1	VALID TERM INFORMATION 00/03/01 15:00	SECRET INFORMATION secret 1
-----------------------------------	---	-----------------------------------



VALID TERM INFORMATION  
= {  
  {DATE AND TIME OF VALID TERM+}  
  {CERTIFICATE ID Cid}  
}

NAME OF GROUP server X.group 1	VALID TERM INFORMATION 00/03/01 15:00	24907435	SECRET INFORMATION secret 1	Cid
-----------------------------------	---	----------	-----------------------------------	-----

Fig. 42



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Fig. 43

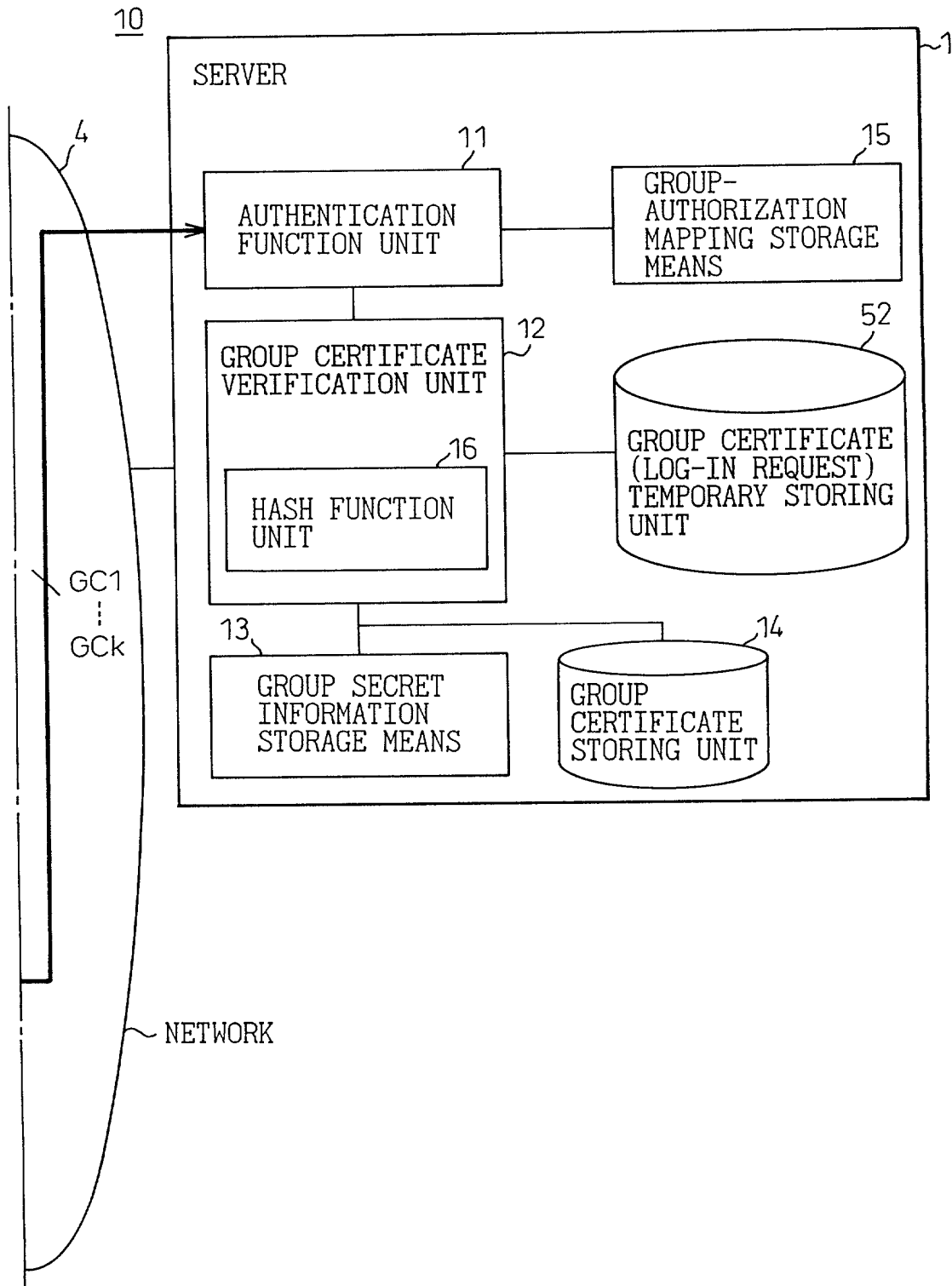


Fig. 44

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USER	GROUP
server X,user A server X,user B server Y,user A server Y,user C ⋮	group 3,group 4 group 1,group 2,group 3 group 4,group 5 group 4,group 3,group 2 ⋮

FIG. 45

Fig. 45

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DATA HELD BY GROUP CERTIFICATE  
TEMPORARY STORING UNIT

GROUP CERTIFICATE			SESSION ID
NAME OF GROUP	VALID TERM INFORMATION	time stamp	
server X.group 1	00/03/01	14:00	4820100
server X.group 2	00/03/01	14:00	4820100
server X.group 3	00/03/01	14:00	4820100
server X.group 2	00/03/01	15:00	2351121
server X.group 4	00/03/01	15:00	2351121
⋮	⋮	⋮	⋮

Fig. 46

GROUP CERTIFICATE  
ISSUING APPARATUS 33

CLIENT 2

GC1

GC2

GC3

ASSUMING THAT GROUP  
CERTIFICATES FOR THREE GROUPS  
group 1, group 2, AND group 3  
HAVE BEEN ISSUED

SERVER 1

\*2

\*1

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Fig. 47

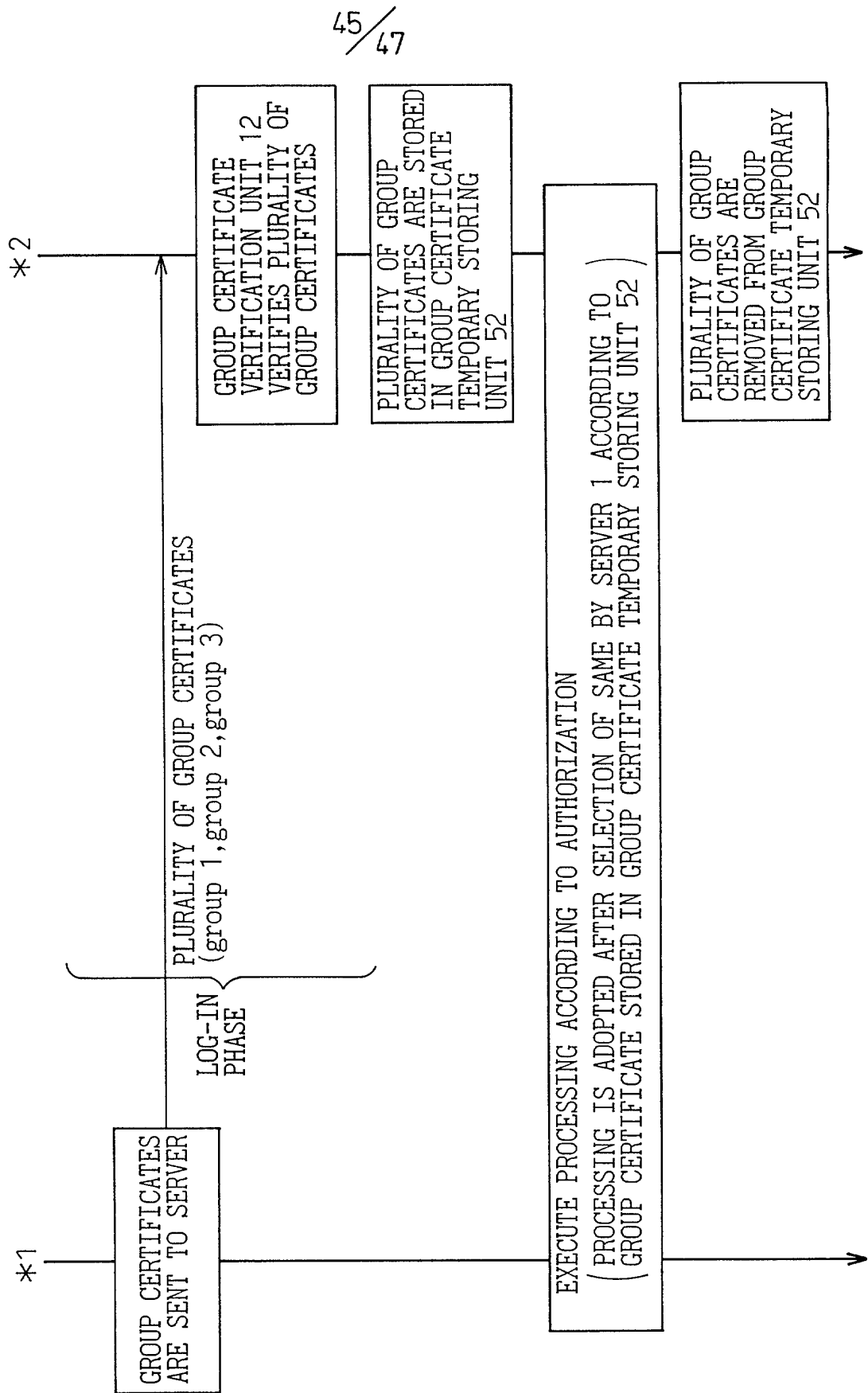


Fig. 48

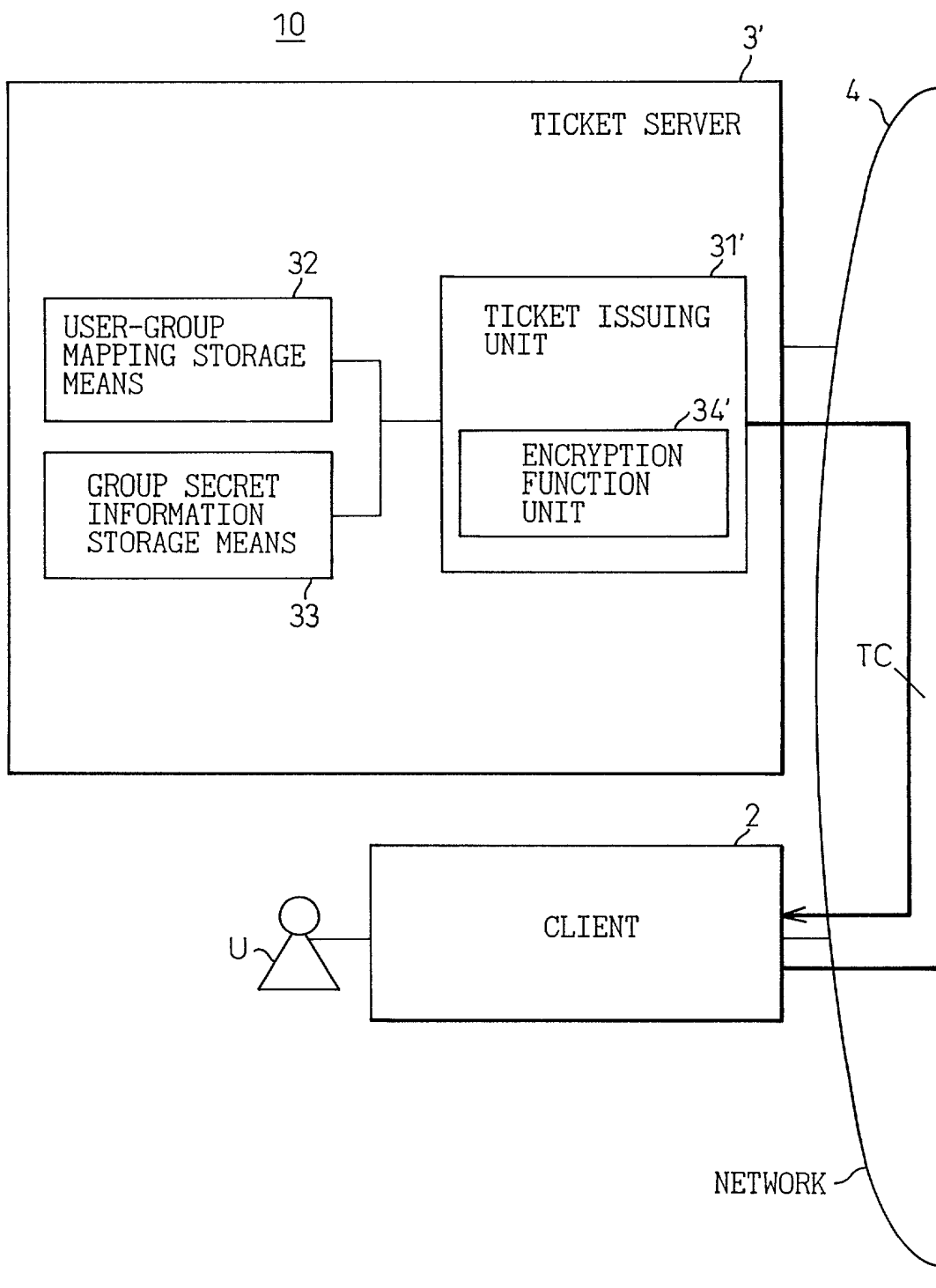


Fig. 49

